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ABSTRACT

This programed instruction study guide is one of a series that form a first-year algebra course. Structured in a multiple-choice question-answer format with scrambled pages, it is intended to be used in conjunction with a computer-managed instructional system. The following topics are covered in Volume 14: methods of solving systems of equations, graphing pairs of inequalities, verbal problems using two variables, and determining the equation of a line. Reading and homework assignments are taken from the text "Modern Algebra - Book I" by Dolciani. (Related documents are SE 015 854 - SE 015 870.) (DT)

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PROGRAMMED MATH CONTINUUM

level one

ALGEBRA

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VOLUME

14

NEW YORK INSTITUTE OF TECHNOLOGY
OLD WESTBURY, NEW YORK

ED 075215

P R O G R A M M E D M A T H C O N T I N U U M

LEVEL ONE

A L G E B R A

VOLUME 14

New York Institute of Technology

Old Westbury - New York

PREFACE

This volume is one of a set of 18

that form a complete course

in

ALGEBRA - LEVEL ONE

The volume has been structured

in a multiple choice question-answer format,

with the pagination scrambled

and

is to be used in conjunction with

a program control console

utilizing

punch card input.

It is one exhibit in the demonstration of a model

developed under the direction of

the U.S. Department of Health Education and Welfare

Project 8-0157

at the

New York Institute of Technology

Westbury, New York

VOLUME 14

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IN THE STUDY GUIDE:

QUESTION:	SEGMENT:	IS ON PAGE:
1	1	1/1
1	2	50/1
1	3	69/1
1	4	110/1
1	5	148/1

VOLUME 14

This volume covers the following material as shown in this excerpt from the Syllabus:

SEGMENT	DESCRIPTION	REFERENCE BOOK SECTION		
		DOLCIANI	DRESSLER	DODES
1	System of equation-addition - subtraction multiplication with addition - subtraction	10-2 10-4	16- 2 16- 2	6- 9 6- 9 6- 1
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** Special treatment needed - text will not be followed

READING ASSIGNMENT

VOLUME 14

Before you begin to answer the questions in this STUDY GUIDE you should read the pages indicated.

SEGMENT	FROM PAGE	TO PAGE
1	370	377
2	378	379
3	379	381
4	372	377
5	349	350

Modern Algebra Book I
Dolciani, Berman and Freilich
Houghton Mifflin, 1965

Read EVERYTHING contained in these pages.

EXAMINE every illustrative problem

Write in your NOTEBOOK:

1) Every RULE that has been stated
2) Every DEFINITION that has been presented
3) Solve at least ONE PROBLEM of each type covered in the lesson.

If you wish additional information for enrichment purposes consult:

Algebra I
Dodes and Greitzer
Hayden Book Co., 1967

You will be given additional notes at various places in the STUDY GUIDE.

These, too, should be entered in your NOTEBOOK.

HOMEWORK ASSIGNMENT

VOLUME NO. 14

BOOK: DOLCIANI

HOMEWORK QUESTION NO.	PAGE NO.	EXAMPLE NUMBER	MBO REFERENCE
1	372	5	14120
2	372	9	14110
3	376	2	14130
4	376	9	14130
5	376	12	14140
6	378	3	14210
7	378	7	14210
8	378	15	14210
9	380	3	14320
10	380	5	14320
11	380	11	14320
12	380	12	14320
13	374	3	14411
14	374	9	14413
15	377	3	14410
16	377	12	14414
17	350	10	14530
18	350	15	14530
19	360	7	14535
20	361	14	14530

GENERAL INSTRUCTIONS

Ask your teacher for:

PUNCH CARD
PROGRAM CONTROL
ANSWER MATRIX

When you are ready at the PROGRAM CONTROL

Insert the PUNCH CARD in the holder
Turn to the first page of the STUDY GUIDE
Read all of the instructions
Read the First Question

Copy the question
Do your work in your notebook
Do all of the computation necessary
Read all of the answer choices given

Choose the Correct answer
(remember, once you've punched the card
it can't be changed)

Punch the card with the STYLUS

Read the instruction on the PROGRAM CONTROL
(it tells you which page to turn to)

TURN TO THAT PAGE:

If your choice is <u>not correct</u> you will be given additional hints, and will be directed to return to the question and to choose another answer.

If your choice is <u>correct</u> then you will be directed to proceed to the next question located immediately below, on the same page.

If you have no questions to ask your teacher now, you can turn the page and begin. If you have already completed a SEGMENT turn to the beginning of the following segment;

CHECK THE PAGE NUMBER BY LOOKING AT THE TABLE OF CONTENTS

Volume 14 Segment 1 begins here:

Obtain a PUNCH CARD from your instructor. In addition to the other identifying information that must be furnished by you you are asked to punch out the following:

COLUMNS	48	and	50	2	1 (Sequence Number)
	54	and	56	0	4 (Type of Punch Card)
	60	and	62	1	4 (Volume Number)
	66	and	68	0	1 (Segment Number)

Your READING ASSIGNMENT for this Segment is pg: 370 - 377
You will now be asked a series of questions to draw your attention to the more important points.

One method for solving two simultaneous linear equations in two variables is the substitution of one variable which is expressed in equation terms of the other variable and which was formed from the other equation. Sometimes this method becomes unwieldy.

You should recognize that another satisfactory method employing addition can be used to eliminate one variable if in both equations, that variable had coefficients which are numerically equal but opposite in sign. In the same way, coefficients which are numerically equal and have the same sign call for subtraction.

Now you are ready to proceed with the questions.

Question 1

In order to solve the following pairs of equations choose the best of the methods listed.

$$\text{I} \begin{cases} 2x + y = 5 \\ x - y = 1 \end{cases} \qquad \text{II} \begin{cases} 5x - 2y = 1 \\ 3x - 2y = 1 \end{cases}$$

(A) I add, II subtract

(B) I add, II add

(C) I subtract, II subtract

(D) I subtract, II add

$\frac{2}{1}$

If you add the two equations correctly, you get

$$8x = 8$$

Therefore, this choice is incorrect.

Return to page $\frac{22}{2}$ and try question 3 again.

$\frac{2}{2}$

You should solve for both variables by first using the subtraction principal and then CHECKING both values found in BOTH equations.

The incorrect values could possibly check out in one equation, but they wouldn't in the other.

Return to page $\frac{25}{2}$ and try question 9 again.

This is the solution set for both equations. Let us review the method generally used to solve the problem.

I	$2x + 5y = 8$	Since the coefficients of "y" are equal absolute
II	$3x - 5y = 2$	values and have opposite signs, we can add.
	$5x = 10$	Divide both sides by 5 . Substitute in one of
	$x = 2$	the equations, say equation I. (See note below)

I	$2(2) + 5y = 8$	
	$4 + 5y = 8$	subtract 4
	$5y = 4$	divide by 5
	$y = \frac{4}{5}$	Check this value in the <u>other</u> equation by sub-
		stituting $x = 2$ and $y = \frac{4}{5}$

II $3(2) - 5(\frac{4}{5}) \stackrel{?}{=} 2$

$6 - 4 \stackrel{?}{=} 2$

$2 = 2$

NOTE: We could have substituted $x = 2$ in equation II to find "y" and then checked both values in equation I.

Now proceed to question 7 below.

<u>Question 7</u>

State in which two of the three equations you could eliminate one variable by using the subtraction principle:

I: $x + 3y = 4$ II: $3x + 3y = 4$ III: $2x - 3y = 5$

(A) III from I (B) I from II (C) III from II (D) None

$\frac{4}{1}$

If you add these equations together, you will get

$$6x + 4y = 10$$

Since you have not eliminated a variable, this choice is not correct.

Return to page $\frac{28}{1}$ and try question 2 again.

$\frac{4}{2}$

You have chosen numbers which are common multiples, but they are not the lowest common multiples.

Return to page $\frac{34}{2}$ and try question 10 again.

$\frac{5}{1}$

If you tried checking these values in the second equation, you would get

$$1 + 6(0) \stackrel{?}{=} \frac{5}{2}$$

$$1 + 0 \stackrel{?}{=} \frac{5}{2}$$

obviously $1 = \frac{5}{2}$

Return to page $\frac{38}{1}$ and try question 5 again.

$\frac{5}{2}$

If you subtract these two equations, there is no doubt that the y terms will drop out. However, these equations are not equivalent to the original equations. You have made an error in calculation.

Return to page $\frac{26}{2}$ and try question 12 again.

$\frac{6}{1}$

In these equations, to eliminate at " x ":

I $5x + y = 7$	$\prec$ multiply by 3	$15x + 3y = 21$
II $3x - 2y = 5$	$\prec$ multiply by 5	$\underline{15x - 10y = 25}$ subtracting
		$13y = 4$

To eliminate at y:

I $5x + y = 7$	multiply by 2	$10x + 2y = 14$
II $3x - 2y = 5$		$\underline{3x - 2y = 5}$ add
		$13x = 19$

Since the first case appears as one of the choices, this answer is correct.

Proceed to question 14 below.

$\frac{6}{2}$

Solve the equations:

$$\begin{aligned} &\text{I} \quad 3x + y = 1 \\ &\text{II} \quad 2x + 3y = 10 \end{aligned} \quad \text{for x and y}$$

Choose the proper pair of sets that contain the correct value for " x " and " y " as members of the set.

(A) $x \in \{7, 6, 5, 4\}$
$y \in \{3, 2, 1, 0\}$

(B) $x \in \{-3, -2, -1, 0\}$
$y \in \{1, 2, 3, 4\}$

(C) $x \in \{-7, -6, -5, -4\}$
$y \in \{3, 2, 1, 0\}$

(D) $x \in \{3, 2, 1, \frac{1}{2}\}$
$y \in \{1, 2, 3, 4\}$

$\frac{7}{1}$

If the coefficients of the same variable are exactly the same in both equations, then that variable can be eliminated by subtraction.

I	$3x + 3y$	$= 4$		
	$x + 3y$	$= 4$		Subtraction (change signs and add)
	$2x$	$= 0$		Divide by 2
	x	$= 0$		"y" has been eliminated.

This answer is correct.

Now proceed to question 8 below.

$\frac{7}{2}$

Question 8

If you apply the subtraction principle to the solution of the following pair of equations, which derived equation do you get?

$3x - y = 4$ $\qquad\qquad$ $3x + y = 5$

(A) $\quad y = \frac{1}{2}$

(B) $\quad y = -\frac{1}{2}$

(C) $\quad y = 2$

(D) $\quad y = 1$

$\frac{8}{1}$

These numbers will permit you to eliminate " x " from the set of equations, but you would not be using the lowest common multiple of the x coefficients.

Return to page $\frac{21}{2}$ and try question 11 again.

$\frac{8}{2}$

You have chosen the correct multiplier, but there is an error in your calculation.

Return to page $\frac{24}{2}$ and try question 15 again.

By using the addition principle, the derived equation would become $5x = 10$, which would make $x = 2$. Substitute this value for x in either equation to find the value for y.

If you tried checking these values in the first equation, you would get

$$2(2) + 5\left(-\frac{4}{5}\right) \stackrel{?}{=} 8$$

$$4 - 4 \stackrel{?}{=} 8$$

$$0 \stackrel{?}{=} 8$$

Obviously $0 \neq 8$

Therefore, your answer is incorrect.

Return to page $\frac{32}{1}$ and try question 6 again.

This choice is correct.

Now proceed to question 13 which follows.

Question 13

If you apply the proper procedures to eliminate one variable from the pair of equations:

I. $5x + y = 7$ II. $3x - 2y = 5$

Which equation could be the result?

(A) $13y = -4$

(B) $13x = 12$

(C) $13y = 4$

(D) None of these

$\frac{10}{1}$

If you add the equations in II, you will get

$$8x - 4y = 2$$

Since the object was to eliminate one of the variables, this is not the correct choice.

Return to page $\frac{1}{2}$ and try question 1 again.

$\frac{10}{2}$

Arrange your work neatly. Do one step at a time. Check signs. Check your answer in both equations; you will discover they do not check.

Return to page $\frac{6}{2}$ and try question 14 again.

This choice is correct.

Now proceed to question 4 which follows:

Question 4

In solving the pair of equations,

$$\text{I: } x - 2y = 4 \qquad \text{II: } 2x + 2y = 5$$

by addition we find that

$$3x = 9 \quad \text{or} \quad x = 3$$

Applying the principle of substitution to find y, we get

(A) I $y = \frac{1}{2}$

II $y = -\frac{1}{2}$

(B) I $y = -\frac{1}{2}$

II $y = \frac{1}{2}$

(C) I $y = -\frac{1}{2}$

II $y = -\frac{1}{2}$

(D) I $y = \frac{1}{2}$

II $y = \frac{1}{2}$

If you multiply the first equation by 2 and add the two equations together, you will not get this result, although this is close. You have made an error in calculation.

Return to page $\frac{9}{2}$ and try question 13 again.

$\frac{12}{1}$

If you subtract these equations, neither variable drops out. Remember that you must change the signs of the terms which you are subtracting so that you will get

$$-x + 6y = -1$$ when you subtract.

Therefore, this choice is not correct.

Return to page $\frac{3}{2}$ and try question 7 again.

$\frac{12}{2}$

The simplest equation will result when you multiply by the lowest common denominators, which is also called the lowest common denominator. You have used a number which is larger than necessary.

Return to page $\frac{24}{2}$ and try question 15 again.

If you add these equations together, you will get

$$5x + y = 9$$

Since you have not eliminated a variable, this choice is not correct.

Return to page $\frac{28}{1}$ and try question 2 again.

Both the numbers you have chosen are common multiples. However, one of them is larger than necessary; remember that you are looking for the lowest common multiple for each separate set of coefficients.

Return to page $\frac{34}{2}$ and try question 10 again.

$\frac{14}{1}$

If you tried checking these values in the second equation, you would get

$$0 + 6\frac{2}{3} \stackrel{?}{=} \frac{5}{2}$$

$$4 \stackrel{?}{=} \frac{5}{2} \quad \text{obviously} \quad 4 \neq \frac{5}{2}$$

Therefore, your answer is incorrect.

Return to page $\frac{38}{1}$ and try question 5 again.

$\frac{14}{2}$

It is true that a subtraction will cause one of the variables to drop out. However, these equations are incorrect, since they are not equivalent to the original equations. You have made an error in calculation.

Return to page $\frac{26}{2}$ and try question 12 again.

The lowest common denominator of all the fractions is 20. On multiplying each member of the equation by 20, we get the result:

$$12x = 15y - 10$$

Now by subtracting 15y from both sides, we obtain the equation listed in this choice. We must recognize that a, b, and c do not have to be positive even though the equation is written as

$$ax + by = c$$

Therefore, this choice is correct.

Now proceed to question 17 below.

Question 17

In order to solve the system of equations:

$$\text{I} \quad \frac{p}{4} - \frac{w}{6} = 0 \qquad \text{II} \quad \frac{3p}{8} + \frac{5w}{12} = -4$$

They should first be transformed to the form

$$ax + by = c$$

If you apply the proper procedures, which pair of equations result?

(A) $3p - 2w = 12$
$9p + 10w = -4$

(B) $3p - 2w = 12$
$9p + 10w = 96$

(C) $3p - 2w = 0$
$9p + 10w = -96$

(D) $3p - 2w = 0$
$9p + 10w = -4$

$\frac{16}{1}$

Before you make your final choice, you should not only check your subtraction, but also continue the solution to find the corresponding value for x. Then by substituting in both equations, you can check your work.

You will find that your choice does not lead to a correct check.

Return to page $\frac{7}{2}$ and try question 8 again.

$\frac{16}{2}$

If you have solved the equations correctly, the value you got for y is not 0, 1, or 2. Therefore, this choice is incorrect.

Return to page $\frac{40}{2}$ and try question 19 again.

17/1

These numbers will permit you to eliminate " y " from the set of equations, but you would not be using the lowest common multiple of the y coefficients.

Return to page 21/2 and try question 11 again.

17/2

One of the other choices listed does give the correct equation.

Return to page 24/2 and try question 15 again.

$\frac{18}{1}$

By using the addition principle, the derived equation would become

$$5x = 10 \quad \text{which would make}$$

$$x = 2$$

Substitute this value for x in either equation to find the value for y.

If you tried checking these values in the first equation, you would get

$$2(2) + 5(-\frac{8}{5}) \stackrel{?}{=} 8$$

$$4 - 8 \stackrel{?}{=} 8$$

$$-4 \stackrel{?}{=} 8$$

Obviously $-4 \neq 8$. Therefore, your answer is incorrect.

Return to page $\frac{32}{1}$ and try question 6 again.

$\frac{18}{2}$

Since this equation is in the form

$$ax = by + c \quad \text{rather than}$$

$$ax + by = c$$

it is not the correct choice.

Return to page $\frac{36}{2}$ and try question 16 again.

If you subtract the equations in I, you will get

$$x + 2y = 4$$

Since the object was to eliminate one of the variables, this is not the correct choice.

Return to page 1/2 and try question 1 again.

This choice is correct.

Now proceed to question 18 which follows.

Question 18

Perform the calculations to find the solution set of the equations:

$$5x + 8y = \frac{1}{3} \qquad 3x - 3y = -5$$

Choose the pair of sets that contain the single value for x and the single value for y that you found.

(A) $x \in \{1, 3, 5, 8, 9\}$ $y \in \{\frac{1}{2}, \frac{1}{3}, \frac{1}{5}, \frac{1}{8}, \frac{1}{9}\}$

(B) $x \in \{-4, -3, -2, -1, 0\}$ $y \in \{1, 2, 3, 4, 5\}$

(C) $x \in \{\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{2}{3}\}$ $y \in \{-5, -4, -3, -2, -1\}$

(D) $x \in \{-\frac{4}{3}, -\frac{3}{2}, -\frac{2}{1}, -\frac{1}{2}, -1\}$ $y \in \{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}\}$

$\frac{20}{1}$

Once you have the value for x you can substitute it for x in either equation to find the corresponding value for y.

In equation II

$2x$	$+$	$2y$	$=$	5	substitute $x = 3$
$2(3)$	$+$	$2y$	$=$	5	
6	$+$	$2y$	$=$	5	subtract 6 from both sides
		$2y$	$=$	-1	divide by $+2$
		y	$=$	$-\frac{1}{2}$	

$\frac{2}{}$ Use this same method in equation I; be very careful of your signs.

Return to page $\frac{11}{1}$ and complete problem 4.

$\frac{20}{2}$

If you multiply the first equation by 3 and the second by 5 and then subtract one equation from the other, you will get a result which is close to this. However, this choice means that you have made an error in calculation.

Return to page $\frac{9}{2}$ and try question 13 again.

$\frac{21}{1}$

If you subtract these equations, neither variable drops out. Remember that you must change the signs of the terms which you are subtracting so that you will get

$x + 6y = 1$ when you subtract.

This choice is, therefore, not correct.

Return to page $\frac{3}{2}$ and try question 7 again.

$\frac{21}{2}$

This choice is correct.

Now proceed to <u>question 11</u> which follows:

<u>Question 11</u>

Apply the concept of " Lowest Common Multiple " to decide by what number you would multiply each equation in order to permit you to eliminate one variable.

I $4x + 6y = 9$ II $6x - 3y = 1$

(A) I by 6, II by 4

(B) I by 3, II by 6

(C) I by 3, II by 2

(D) I by 2, II by 4

22
1

Since equations I and II have no coefficients of either x or y that are equal, it is impossible to eliminate a letter by adding these equations. In the same way we can see that it is impossible to use equations II and III. In equations I and III, we find that the x coefficients are equal; also the y coefficients are equal. However, in neither case is there a difference in sign which is required in order for addition to eliminate a variable.

Therefore, this choice is correct.

Proceed to question 3 below.

22
2

Question 3

If you apply the addition principle to the solution of the following pair of equations, which is the first value you get?

$$5x - 2y = 1 \qquad 3x + 2y = 7$$

(A) $x = 1$

(B) $y = -2$

(C) $x = 3$

(D) $y = 2$

If you tried checking these values in the first equation, you would get

$$2(\tfrac{1}{2}) + 3(-\tfrac{1}{3}) \stackrel{?}{=} 2$$

$$1 - 1 \stackrel{?}{=} 2$$

$$0 \stackrel{?}{=} 2$$

Obviously $0 \neq 2$

Therefore, your answer is incorrect.

Return to page $\frac{38}{1}$ and try question 5 again.

When you decide to multiply an equation by a number, it is necessary to multiply each term on each side of the equation by that number.

Did you do the arithmetic correctly?

Return to page $\frac{15}{2}$ and try question 17 again.

24
1

Let us review the method for solving simultaneous linear equations in two variables by the method of multiplication and addition or by subtraction.

Method 1:

I	$3x + y = 1$	multiply by 3	$9x + 3y = 3$	
II	$2x + 3y = 10$		$2x + 3y = 10$	subtract
			$7x = -7$	
			$x = -1$	

Substitute in I

$3(-1) + y = 1$

$-3 + y = 1$ add $+3$

$y = 4$

$x = -1$, $y = 4$ these are found in the sets " B ".

Check in II

$2(-1) + 3(4) \stackrel{?}{=} 10$

$-2 + 12 \stackrel{?}{=} 10$

$10 = 10$

Alternate Method

I	$3x + y = 1$	multiply by -3	$-9x - 3y = -3$	
II	$2x + 3y = 10$		$2x + 3y = 10$	add
			$-7x = 7$	
			$x = -1$	

Observation in the first method: We multiplied by 3 and subtracted the equation.

In the second method: We multiplied by -3 and then added the equation.

Now proceed to question 15 below.

24
2

Question 15

Before attempting to eliminate a variable from a system of equations, where one equation has fractional coefficients, it is desirable to clear the equation of fractions. Apply the proper procedure to find the simplest equation which results from clearing the fractions in the equation

$$\frac{5x}{6} - \frac{y}{4} = 1$$

(A) $10x - 3y = 1$

(B) $10x - 3y = 12$

(C) $20x - 6y = 24$

(D) None of these.

If you subtract I from II

$$\begin{array}{rrrrrl} & 3x & + & y & = & 5 \\ & 3x & - & y & = & 4 \\ \hline \text{you will get} & & & 2y & = & 1 \quad \text{divide by } 2 \\ \text{or} & & & y & = & \frac{1}{2} \end{array}$$

If you subtracted II from I instead,

$$\begin{array}{rrrrrl} & 3x & - & y & = & 4 \\ & 3x & + & y & = & 5 \\ \hline & & - & 2y & = & 1 \quad \text{divide by } -2 \\ & & & y & = & \frac{1}{2} \end{array}$$

You will get the same answer.

So you see, it doesn't make much difference which order you choose. You will still get the same answer.

Now proceed to question 9 below.

Question 9

Apply the principles you have learned to find the set that contains the solution set of the equations:

$3x + 4y = 3$, $6x + 4y = 4$ as a subset

(A) $x \in \{-3, -2, -1, 0, 1, 2, 3\}$
$y \in \{-3, -2, -1, 0, 1, 2, 3\}$

(B) $x \in \{-6, -5, -4, 4, 5, 6\}$
$y \in \{-6, -5, -4, 4, 5, 6\}$

(C) $x \in \left\{-\frac{1}{4}, -\frac{1}{3}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}\right\}$
$y \in \left\{-\frac{1}{4}, -\frac{1}{3}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}\right\}$

(D) $x \in \left\{-\frac{1}{4}, -\frac{1}{3}, -\frac{1}{2}, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}\right\}$
$y \in \{-3, -2, -1, 1, 2, 3\}$

$\frac{26}{1}$

These multipliers would give you equal x coefficients of 12 in both equations. Since 12 is the lowest common multiple of 4 and 6, this is the correct choice.

Now proceed to question 12 which follows.

$\frac{26}{2}$

Question 12

If you apply the principle of multiplication in order to eliminate y in the following pair of equations, what will be the resulting equations?

$$\text{I} \quad 2x - 6y = 5$$
$$\text{II} \quad 3x - 4y = 17$$

(A) $6x - 18y = 15$
$6x - 8y = 34$

(B) $4x - 12y = 5$
$9x - 12y = 17$

(C) $6x - 18y = 5$
$6x - 8y = 17$

(D) $4x - 12y = 10$
$9x - 12y = 51$

By using the addition principle, the derived equation would become

$$5x = 10$$

which would make $x = 2$

Substitute this value for x in either equation to find the value for y.

If you tried checking these values in the first equation, you would get

$$2(2) + 5(\tfrac{8}{5}) \stackrel{?}{=} 8$$

$$4 + 8 \stackrel{?}{=} 8$$

$$12 \stackrel{?}{=} 8 \quad \text{Obviously } 12 \neq 8$$

Therefore, your answer is incorrect.

Return to page $\frac{32}{1}$ and try question 6 again.

This equation is not in the correct form

$$ax + by = c$$

In addition, you have multiplied by a number which was not the <u>lowest</u> common denominator.

Return to page $\frac{36}{2}$ and try question 16 again.

$\frac{28}{1}$

This choice is correct.

Now proceed to question 2 which follows:

Question 2

State in which two of the following three equations you could eliminate one variable by adding.

$$\text{I} \quad 3x + 2y = 6$$

$$\text{II} \quad 2x - y = 5$$

$$\text{III} \quad 3x + 2y = 4$$

(A) I and II (B) I and III (C) II and III (D) None

$\frac{28}{2}$

If you arrange to eliminate either the x coefficients or the y coefficients by using the lowest common multiple, you will get an equation which is one of those listed in the other choices. If you have a disagreement in signs only from one of these listed, it can be easily explained. If you do a subtraction of two quantities the order is important. Changing the order will change the sign of the result. Therefore, if your result differed from one of the choices in signs, it only means that you subtracted in the reverse order.

Return to page $\frac{9}{2}$ and try question 13 again.

Once you have the value for x, you can substitute it for x in either equation to find the corresponding value for y.

In I:	x	$- 2y$	$= 4$	Substitute $x = 3$	
	(3)	$- 2y$	$= 4$	Subtract 3 from both sides	
		$- 2y$	$= 1$	Divide by -2	
		y	$= -\frac{1}{2}$		

Use this same method in equation II. Be very careful of your signs.

Return to page $\frac{11}{1}$ and complete problem 4.

When you decide to multiply an equation by a number, it is necessary to multiply each term on each side of the equation by that number.

Return to page $\frac{15}{2}$ and try question 17 again.

$\frac{30}{1}$

There is one pair of equations which, on subtraction, will give a result containing only one variable. Therefore, this choice is not correct.

Return to page $\frac{3}{2}$ and try question 7 again.

$\frac{30}{2}$

Since this equation is in the form

$$ax + c = by$$

rather than

$$ax + by = c$$

it is not the correct choice.

Return to page $\frac{36}{2}$ and try question 16 again.

$\frac{31}{1}$

If you add the two equations, the resulting equation has no y term. Therefore, you cannot solve it for y by simply adding.

Return to page $\frac{22}{2}$ and try question 3 again.

$\frac{31}{2}$

If you have solved the equations correctly, the value you got for x is not less than the value for y. Therefore, this choice is not correct.

Return to page $\frac{40}{2}$ and try question 19 again.

$\frac{32}{1}$

This choice is correct.

Now proceed to question 6 which follows:

Question 6

Apply the principles you have learned to find the solution set of the following equations:

$$2x + 5y = 8 \qquad 3x - 5y = 2$$

(A) $\left\{\left(2, -\frac{4}{5}\right)\right\}$

(C) $\left\{\left(2, \frac{4}{5}\right)\right\}$

(B) $\left\{\left(2, -\frac{8}{5}\right)\right\}$

(D) $\left\{\left(2, \frac{8}{5}\right)\right\}$

$\frac{32}{2}$

You have apparently proceeded correctly in both equations. However, you appear to have an error in arithmetic.

Return to page $\frac{15}{2}$ and try question 17 again.

Let us review the procedure for solving simultaneous linear equations by subtraction. We look for the same absolute values for the coefficients of one of the variables.

e.g. $ax + by = c$ / $ax + dy = e$ or $ax + by = c$ / $dx + by = c$

If we find them then we can eliminate the variable by using the subtraction principle.

In this case
$$\begin{array}{rlll} \text{I} & 6x + 4y & = & 4 \\ \text{II} & \underline{3x + 4y} & = & \underline{3} \\ & 3x & = & 1 \end{array}$$

The y coefficients are the same, therefore, we subtract.

$$x = \frac{1}{3}$$

Substitute the value found for x in one of the equations, say I

$$6(\tfrac{1}{3}) + 4y = 4$$

$$2 + 4y = 4 \quad \prec -2$$

$$4y = 2 \quad \prec \div 4$$

$$y = \frac{1}{2}$$

Check in the other, in this case II

$$3(\tfrac{1}{3}) + 4(\tfrac{1}{2}) \stackrel{?}{=} 3$$

$$1 + 2 \stackrel{?}{=} 3$$

$$3 = 3$$

$x = \frac{1}{3}$

$y = \frac{1}{2}$

therefore, your choice did contain the solution set.
Now read the notes preparing you for the next situation below.

Note:
If the two equations do not have the conditions present for solution by addition or subtraction, we can alter the equations to make that method of solution possible.

Situation I multiply one equation only

e.g.

$$\begin{array}{rlll} \text{I} & 3x + 4y & = & 10 \\ \text{II} & x + 3y & = & 5 \end{array}$$

if this equation is multiplied by 3, then equations I and II' can be subtracted to eliminate x.

Note:
Equation II becomes:

$$\text{II}' \quad 3x + 9y = 15$$

Please continue on page 34/1

34
1

Situation 2 occurs when the coefficient of a variable is not a multiple of the coefficient of the other.

One possibility is:

$$\begin{array}{rcl} 3x + 4y = 10 & \text{multiply by } 2 & 6x + 5y = 20 \\ 2x + 3y = 7 & \text{multiply by } 3 & 6x + 9y = 21 \end{array}$$

A second possibility is:

$$\begin{array}{rcl} 3x + 4y = 10 & \text{multiply by } 4 & 12x + 16y = 40 \\ 2x + 3y = 7 & \text{multiply by } 6 & 12x + 18y = 42 \end{array}$$

If the lowest common multiple is used, the resulting equations will have smaller coefficients and will generally be easier to solve.

34
2

Question 10

Apply the principles you have learned to find the " Lowest Common Multiple " of the x coefficients and of the y coefficients for the following equations:

$$4x + 6y = 9 \qquad 6x - 2y = 1$$

	The LCM of the x coefficients is:	The LCM of the y coefficients is:
(A)	24	12
(B)	24	6
(C)	12	12
(D)	12	6

$\frac{35}{1}$

These equations would permit you to eliminate x by subtraction.

However, the question asked you to prepare to eliminate y.

Return to page $\frac{26}{2}$ and try question 12 again.

$\frac{35}{2}$

Did you take the trouble to attempt to solve the equations?

Did you check your answers?

If so, you made a mistake in the process.

Return to page $\frac{19}{2}$ and try question 18 again.

$\frac{36}{1}$

To eliminate the fractions from the equation

$$\frac{5x}{6} - \frac{y}{4} = 1$$ we must multiply by the

LCM of the denominators.

Now the multiples of 6 are 6 , 12 , 18 , 24 , 30 , 36 , ...

the multiples of 4 are 4 , 8 , 12 , 16 , 20 , 24 , 28 , 32 , 36 ,. . .

Now 12 , 24 , 36 , ... are <u>common</u> multiples, but 12 is the lowest.

Therefore, $\frac{5x}{6} - \frac{y}{4} = 1$ multiply by 12

$$12(\frac{5x}{6}) - 12(\frac{y}{4}) = 12(1)$$

$$10x - 3y = 12$$

Your choice was correct.

Proceed to question 16 below.

$\frac{36}{2}$

<u>Question 16</u>

Before attempting to eliminate a variable from a system of equations, it is desirable that each equation be put in the form

$ax + by = c$ where a , b , and c are integers.

If you apply the procedures to do this to the equation

$$\frac{3x}{5} = \frac{3y}{4} - \frac{1}{2}$$ the result is:

(A) $12x - 15y = -10$

(B) $12x = 15y - 10$

(C) $24x = 30y - 20$

(D) $12x + 10 = 15y$

If you add these equations together, you will get

$$5x + y = 11$$

Since you have not eliminated a variable this choice is not correct.

Return to page $\frac{28}{1}$ and try question 2 again.

If you have solved the equations correctly, the value you got for x does not equal the value for y.

Therefore, this choice is not correct.

Return to page $\frac{40}{2}$ and try question 19 again.

$\frac{38}{1}$

This choice is correct.

Now proceed to question 5 which follows:

Question 5

Apply the principles of substitution to decide which is the solution set of the equations:

$$2x + 3y = 2$$
$$x + 6y = \frac{5}{2}$$

(A) $\{(1, 0)\}$

(B) $\{(0, \frac{2}{3})\}$

(C) $\{(\frac{1}{2}, -\frac{1}{3})\}$

(D) $\{(\frac{1}{2}, \frac{1}{3})\}$

$\frac{38}{2}$

In order to solve for x in equation II, the first step gives us

$$2x = 1 - y$$

and then it is necessary to divide it by 2 to get the value for x. That means we would have to substitute and work with a fraction. There is a better choice.

Return to page $\frac{50}{1}$ and try question 1 again.

If you have solved the equations correctly, the value which you found for x is smaller that 1.

Therefore, this choice is incorrect.

Return to page 46/2 and try question 20 again.

In solving equation I for x, the first step would give us

$$7x = 3 + y$$

It would then be necessary to divide both sides of the equation by 7, which would result in a fractional value for x.

This is a wrong choice because it is possible to avoid working with fractions in this problem.

Return to page 41/2 and try question 3 again.

$\frac{40}{1}$

Your choice contains the correct values.

Let us review the method.

$$\begin{array}{llllllll} \text{I} & 5x + 8y = \frac{1}{3} & \text{multiply by } 3 & \text{I}' & 15x + 24y = 1 & & \\ \text{II} & 3x - 3y = -5 & \text{multiply by } 8 & \text{II}' & 24x - 24y = 40 & \text{add} & \end{array}$$

$$39x = -39$$

$$x = -1 \qquad \text{substitute in II}$$

$$\text{II} \quad 3(-1) - 3y \stackrel{?}{=} -5$$

$$-3 - 3y \stackrel{?}{=} -5 \qquad \text{add } 3$$

$$-3y = -2$$

$$y = \frac{2}{3}$$

Check

$$\text{I} \quad 5(-1) + 8\left(\frac{2}{3}\right) \stackrel{?}{=} \frac{1}{3}$$

$$-5 + \frac{16}{3} \stackrel{?}{=} \frac{1}{3}$$

$$\frac{-15}{3} + \frac{16}{3} \stackrel{?}{=} \frac{1}{3}$$

$$\frac{1}{3} = \frac{1}{3}$$

Proceed to Question 19 below.

$\frac{40}{2}$

Question 19

Apply the procedures you have learned to solve the equations:

$$3x - 2y = 5 \qquad 2x + 5y = -3$$

Which choice describes the solutions?

(A) $x \in \{0, 1, 2\}$

(B) $y \in \{0, 1, 2\}$

(C) $x = y$

(D) $x < y$

Since both equations have the term $+2y$, the best procedure would be to subtract one equation from the other.

You must remember that the method of substitution is only one method of solving a set of equations. In this case, the method of elimination of one variable by subtraction is the best procedure.

Therefore, this choice is the best choice.

Now proceed to question 3 below.

Question 3

If you are asked to solve the set of equations,

$$\text{I. } 7x - y = 3 \quad \text{II. } 4x + 2y = 5$$

choose which of the following methods you would prefer:

(A) Solve equation I for x and substitute in equation II.

(B) Solve equation I for y and substitute in equation II.

(C) Solve equation II for x and substitute in equation I.

(D) Solve equation II for y and substitute in equation I.

$\frac{42}{1}$

This choice is correct.

Now proceed to question 5 which follows:

Question 5

If you apply the method of substitution to solve the equations

$$x - 4y = 8$$

$$2x + 5y = -1$$

which value might you use to substitute?

(A) $y = \frac{x + 8}{4}$ (C) $x = \frac{5y - 1}{2}$

(B) $x = 4y - 8$ (D) $y = \frac{-2x - 1}{5}$

$\frac{42}{2}$

You are very close.

However, you have made a mistake in signs.

Return to page $\frac{65}{2}$ and try question 8 again.

If you have solved these equations correctly, the value which you found for y is smaller that 1.

Therefore, this choice is not correct.

Return to page $\frac{46}{2}$ and try question 20 again.

If your solution to the equation were correct, you should not have chosen this incorrect answer.

Check your substitution in both equations.

Return to page $\frac{51}{2}$ and try question 11 again.

$\frac{44}{1}$

If you proceed to solve equation I for x , the first step gives the result

$$5x = -1 - 2y$$

Since a division by 5 would now be necessary, this would result in substituting and working with a fractional value. This is not the best way.

Return to page $\frac{64}{1}$ and try question 2 again.

$\frac{44}{2}$

The value you have obtained must be wrong if you picked this choice. First apply the distributive law. Then clear the fraction by multiplying both sides of the equation by 4 . Watch that loose "y" !

Return to page $\frac{60}{2}$ and try question 10 again.

If you solve the first equation for y, this is the value you will obtain; but it is not the value you should substitute, because it is a fraction. It is possible to follow the instructions without getting involved with fractions.

Return to page 66/2 and try question 4 again.

The value you have obtained is very close to being correct.

However, you have a mistake in a sign.

Return to page 74/2 and try question 6 again.

$\frac{46}{1}$

If you have solved the equations correctly, you found that

$$x = 1 \quad \text{and} \quad y = -1$$

Therefore, only this choice describes the solution correctly.

Now proceed to question 20 below.

$\frac{46}{2}$

Question 20

Apply the procedures you have learned to solve the equations:

$$2x + 7y = 1 \qquad 5x - [illegible] = 3$$

Which choice describes the solutions?

(A) $x > 1$
$y < 1$

(B) $x < 1$
$y < 1$

(C) $x > 1$
$y > 1$

(D) $x < 1$
$y > 1$

In solving equation I for x , we first get

$$3x = 5 + 2y.$$

Then we divide by 3 , getting a fractional expression for x .

This is not the best choice.

Return to page 50/1 and try question 1 again.

Since you have substituted a value for x , and the equation had $3x$ in it, you need three times the value of x .
The expression you have chosen merely says that 3 is to be multiplied by 1 and then you intend to add $-5y$ and $-y$ to the result.

This is incorrect.

Return to page 52/2 and try question 7 again.

$\frac{48}{1}$

If you obtained this value of y from the first equation, you have made a mistake in a sign.

Return to page $\frac{42}{1}$ and try question 5 again.

$\frac{48}{2}$

Solving equation II for x, we first get

$$4x = 5 - 2y$$

Then, dividing by 4, we get a fractional expression for x. Since it is possible to do this problem without using fractions, this is not the correct choice.

Return to page $\frac{41}{2}$ and try question 3 again.

You should have found that the value of

$$x \quad \text{is} \quad \frac{22}{37}$$

and the value of y is $-\frac{1}{37}$

Therefore it is correct to state that each of them is smaller than 1 .

You have now completed this segment. You should do assignment 14 , questions 1 - 4 before going on to segment 2 .

VOLUME 14 SEGMENT 2 begins here:
Obtain a PUNCH CARD from your instructor. In addition to the other identifying information that must be furnished by you, you are asked to punch out the following:

COLUMNS	48 and 50	2	2	(Sequence Number)
	54 and 56	0	4	(Type of Punch Card)
	60 and 62	1	4	(Volume Number)
	66 and 68	0	2	(Segment Number)

Your READING ASSIGNMENT for this Segment is page: 378

SUPPLEMENTARY NOTES:
If either variable appears with a coefficient of 1 in either equation, you can solve that equation for that variable easily. For example, suppose the equations are

$$3x + 5y = 7 \quad \text{and} \quad 5x - y = 2$$

In the second equation, we can solve for y , getting

$$y = 5x - 2$$

This value $5x - 2$ can then be substituted for y in the first equation.

However, if you solve for a variable whose coefficient is not 1 , you may become involved with fractions. For example, consider

$$2x + 5y = 4 \ , \quad 3x - 2y = 8$$

If you solve the first equation for y , you get

$$5y = 4 - 2x \quad \text{and then} \quad y = \frac{4 - 2x}{5}$$

This value would have to be substituted for y in the second equation.

The method of substitution is really useful mainly when you have a coefficient of 1 for one unknown in either equation.

Turn to page $\frac{50}{1}$ for question 1 .

$\frac{50}{1}$

Question 1

In solving the following equations by substitution, which method would you choose as the best procedure?

I. $3x - 2y = 5$ II. $2x + y = 1$

(A) Solve for x in equation II

(B) Solve for y in equation II

(C) Solve for x in equation I

(D) Solve for y in equation I

$\frac{50}{2}$

This choice is correct.

Now proceed to question 9 which follows:

Question 9

Apply the principles necessary to solve the equation

$$2 (3 - 4y) - 3y = 17$$

(A) $y > 0$

(B) $y \in \{-2 , 0 , 2\}$

(C) $y < 0$

(D) y is an even number

The first step in the solution of this equation should be to multiply the fraction by 3:

$\frac{6y - 3}{4} + y = 2$ Next we should multiply each term on both sides of the equation by the LCD 4, getting

$6y - 3 + 4y = 8$ Combining the terms, we get

$10y - 3 = 8$ and adding 3 to both sides, we obtain

$10y = 11$ Therefore, the value of

$y = \frac{11}{10}$ so that this choice is correct.

Now proceed to question 11 below.

Question 11

In solving the equations

$$2x + 5y = 28 \text{ and } 3x + 2y = 31$$

we find that

$$x = 9$$

If you apply the principles you have learned to find y, which choice describes the value?

(A) $y < 0$

(B) $y \in \{-1, 1, 3\}$

(C) y is an odd number

(D) y is an even number

52
1

If you solve the first equation for y , you will get this value. It is unfortunate that this value is a fraction, and it is cumbersome to use; but it is the only value offered which is correct.

Now proceed to question 7 below.

52
2

Question 7

If you apply the principle of substitution to solve the equations

$$x + 5y = 1 \quad \text{and} \quad 3x - y = 4$$

by solving for x in the first equation, which equation could be the result of the substitution?

(A) $3 (1 - 5y) - y = 4$

(B) $(3) 1 - 5y - y = 4$

(C) $3 (5y + 1) - y = 4$

(D) $3 (5y - 1) - y = 4$

If you proceed to solve equation I for y, the first step gives the result

$$2y = -1 - 5x$$

Since a division by 2 would now be necessary, this would result in substituting and working with a fractional value. This is not the best way.

Return to page $\frac{64}{1}$ and try question 2 again.

We can check your work by substituting your answers in both equations. Substituting these values in the first equations, we find that this set is a solution of the first equation. However, trying these numbers in the second equation shows us that the values do not check. Since we wanted a solution of the pair of equations, this choice is incorrect.

Return to page $\frac{68}{2}$ and try question 12 again.

54
1

If you solve the first equation for x , this is the value you will obtain; but it is not the value you should substitute because it is a fraction. It is possible to follow the instructions without getting involved with fractions.

Return to page 66/2 and try question 4 again.

54
2

You have made some mistake in your work, since this choice is not correct.

Examine each step. It is probable that there is a mistake in signs.

Return to page 62/2 and try question 15 again.

In solving equation I for y , we first get

$$-2y = 5 - 3x$$

It is then necessary to divide both sides by -2 , getting a fractional value for y .

There is a better choice.

Return to page 50/1 and try question 1 again.

The values which would cause you to pick this choice cannot be correct.

Return to page 67/2 and try question 14 again.

$\frac{56}{1}$

If you obtained this value of x from the first equation, you have made a mistake in a sign.

Return to page $\frac{42}{1}$ and try question 5 again.

$\frac{56}{2}$

You have shown that you know how to substitute correctly. However, the value you got when you solved for x in the first equation was not correct.

Return to page $\frac{52}{2}$ and try question 7 again.

Solving equation II for y, we first get

$$2y = 5 - 4x$$

Then dividing by 2, we get a fractional expression for y. Since it is possible to do this problem without using fractions, this is not the correct choice.

Return to page 41/2 and try question 3 again.

If you solve this equation, the first step you get is

$$6 - 8y - 3y = 17$$

Then,

$$6 - 11y = 17$$

If you now complete the solution, you will be able to make the correct choice.

Return to page 50/2 and try question 9 again.

58/1

This choice is correct.

Please proceed to question 13 which follows:

Question 13

Apply the method of substitution to solve the set of equations

$$4r - x = -10$$

$$3r + 5s = 4$$

Which choice describes the solution set?

(A) $r = s$

(B) $r = -s$

(C) $r > 0$, $s > 0$

(D) $r < 0$, $s < 0$

58/2

This graph passes through the point (0 , 4) on the Y - axis and the point (4 , 0) on the X - axis.

Since the coordinates of the first point do not satisfy the equation, the graph is incorrect.

Return to page 97/2 and try question 3 again.

Using substitution here suggests that we begin with the first equation. Subtracting $2x$ from both sides gives the result

By dividing both sides by -1, $-y = -2x - 6$

we get $y = 2x + 6$

Now we substitute this value for y in the second equation getting

$$6x + 4(2x + 6) = 3$$

Continuing, we have $6x + 8x + 24 = 3$

Combining terms $14x + 24 = 3$ and subtracting

24 from both sides, $14x = 21$

Dividing by 14 on both sides gives the value of x as

$$-\frac{21}{14} \quad \text{or} \quad -\frac{3}{2}$$

This value for x may be substituted in either equation. In the first equation it would produce the result

$$2\left(-\frac{3}{2}\right) - y = -6$$

and then $-3 - y = -6$

Next, $-y = -3$

and then $y = 3$

In the second equation, we would have

$$6\left(-\frac{3}{2}\right) + 4y = 3$$

$$-9 + 4y = 3$$

$$4y = 12$$

$$y = 3$$

In any case, the solution set is

$$\left(-\frac{3}{2}, 3\right)$$

which means that this choice is correct.

You have now completed this segment.
You should do assignment 14, question 5 - 8 before going on to segment 3.

$\frac{60}{1}$

Solving this equation, we get

$$6 - 8y - 3y = 17 \qquad \text{[collect}$$

Then,

$$6 - 11y = 17 \qquad \prec -6$$

Next we have

$$-11y = 11 \qquad \prec \div 11$$

and, therefore,

$$y = -1$$

Of the four choices listed, this is the only one which is correct.

Now proceed to question 10 below.

$\frac{60}{2}$

Question 10

In solving a set of equations, a student has gotten to the step

$$3\left(\frac{2y - 1}{4}\right) + y = 2$$

If he continues to apply the proper procedures, which statement about the value of y is correct?

(A) y is a negative fraction

(B) y is a positive fraction

(C) y is a negative integer

(D) y is a positive integer

If you add these equations, the result is a new equation:

$$7x + 4y = 0$$

Since this equation still has two variables, it is not the best procedure.

Return to page 64/1 and try question 2 again.

We can check your work by substituting your answers in both equations. Substituting these values, we find that they check in the second equation. However, they do not check in the first equation.

Therefore, this choice is incorrect.

Return to page 68/2 and try question 12 again.

62
1

Using the substitution procedure, we begin by solving the second equation for n.

This gives $n = 33 - 2m$

Substituting this for n in the first equation gives $3m - 4(33 - 2m) = 0$

Performing the multiplication, we get: $3m - 132 + 8m = 0$

Note that the product of -4 and $-2m$ is $+8m$

Combining the terms gives us $11m - 132 = 0$ and adding 132 to both sides results in $11m = 132$

Now dividing both sides of the equation by 11; the result is

$$m = 12$$

Replacing m by this value in either equation permits us to find that

$$n = 9$$

Therefore, this choice is correct.

Now proceed to question 15 below.

62
2

Question 15

Apply the method of substitution to solve the set of equations

$$2x - y = -6 \qquad 6x + 4y = 3$$

Which choice describes the solution set?

(A) $x < 0$, $y > 0$

(B) $x > 0$, $y < 0$

(C) x is a positive integer

(D) y is a negative integer

If you solve the second equation for y, this is the value you will obtain; but it is not the value you should substitute, because it is a fraction. It is possible to follow the instructions without getting involved with fractions.

Return to page 66/2 and try question 4 again.

You probably made a careless mistake.

This choice is incorrect.

Return to page 58/1 and try question 13 again.

$\frac{64}{1}$

This choice is correct.

Now proceed to question 2 which follows:

Question 2

In solving the set of equations,

$$\text{I: } 5x + 2y = -1 \qquad \text{II: } 2x + 2y = 1$$

which method would you choose as the best procedure?

(A) solve equation I for x and substitute in equation II.

(B) solve equation I for y and substitute in equation II.

(C) add equations I and II.

(D) subtract equation II from equation I.

$\frac{64}{2}$

You are quite right in saying that this is equivalent to the original inequality. However, it is the reference line which you need first.

Return to page $\frac{69}{1}$ and try question 1 again.

If you obtained this value of x from the second equation, you have made a mistake in a sign.

Return to page $\frac{42}{1}$ and try question 5 again.

This choice is correct.

Now proceed to question 8 which follows.

Question 8

If you apply the principle of substitution to solve the set of equations

$$3w - 2z = 38 \qquad 2w - z = 18$$

by the simplest method, which equation could be the result of the first substitution ?

(A) $2(\frac{-2z + 38}{3}) - z = 18$

(B) $2w - (\frac{-3w - 38}{2}) = 18$

(C) $3w - 2(2w - 18) = 38$

(D) $3(\frac{z - 18}{2}) - 2z = 38$

66
1

Solving equation I for y , we first get

$$-y = -7x + 3$$

Then dividing by -1, we get

$$y = 7x - 3$$

Since there are no fractions in this expression, it will be easy to work with.

Therefore, this is the correct choice.

Now proceed to question 4 below.

66
2

Question 4

If you apply the method of substitution to solve the equations

$$5x + 2y = 1 \quad \text{and} \quad x - 4y = 0$$

which equation gives the value you would substitute?

(A) $y = \frac{1 - 5x}{2}$

(B) $x = 4y$

(C) $x = \frac{1 - 2y}{5}$

(D) $y = \frac{x}{4}$

Let us review this problem together

$$\text{I} \quad 4r - s = -10 \quad \text{add } s + 10 \quad \text{I}' \; 4r + 10 = s$$

$$\text{II} \quad \underline{3r + 5s = 4} \quad \text{substitute this value for s in II}$$

$$\begin{aligned} 3r + 5(4r + 10) &= 4 && \text{DISTRIBUTIVE LAW} \\ 3r + 20r + 50 &= 4 && \text{combine like terms} \\ 23r + 50 &= 4 && \text{subtract } 50 \\ 23r &= -46 && \text{divide by } 23 \\ r &= -2 \end{aligned}$$

Substitute this value of r for r in equation I'

$$\begin{aligned} 4(-2) + 10 &= s \\ -8 + 10 &= s \\ +2 &= s \end{aligned}$$

Check: $r = -2$, $s = +2$

in I $\quad 4(-2) - (+2) \stackrel{?}{=} -10$ $\qquad$ in II $\quad 3(-2) + 5(+2) \stackrel{?}{=} 4$

$$\begin{aligned} -8 - 2 &\stackrel{?}{=} -10 & \qquad -6 + 10 &\stackrel{?}{=} 4 \\ -10 &= -10 \checkmark & 4 &= 4 \checkmark \end{aligned}$$

therefore,

$r = -s$ is the correct answer.

Now proceed to question 14 below.

Question 14

Apply the method of substitution to solve the set of equations

$$3m - 4n = 0 \;, \quad 2m + n = 33$$

Which choice describes the solution set?

(A) $m < n$ $\qquad$ (C) $m = -n$

(B) $m = n$ $\qquad$ (D) $m > n$

$\frac{68}{1}$

Substituting the value for x in either equation permits you to find that the value of

y is 2 .

Therefore, this choice is correct.

Now proceed to question 12 below.

$\frac{68}{2}$

Question 12

Perform the calculations to determine which choice is the solution set of the pair of equations

$$5x + 2y = 8 \qquad 3x - y = 7$$

(A) $\left\{ (1, \frac{3}{2}) \right\}$

(B) $\{ (1, -4) \}$

(C) $\{ (2, -1) \}$

(D) $\{ (2, 1) \}$

VOLUME 14 SEGMENT 3 begins here:
Obtain a PUNCH CARD from your instructor. In addition to the other identifying information that must be furnished by you, you are asked to punch out the following:

COLUMNS	48 and 50	2	3	(Sequence Number)
	54 and 56	0	4	(Type of Punch Card)
	60 and 62	1	4	(Volume Number)
	66 and 68	0	3	(Segment Number)

Your READING ASSIGNMENT for this Segment is pg: 379 - 381

SUPPLEMENTARY NOTES:
Since each inequality must be replaced by an equation before graphing, it is convenient to refer to the graph of the equation as the reference line. Thus, for the inequality

$$2x - y > 1$$

the reference line has the equation

$$2x - y = 1$$

As your textbook points out, the graph of the inequality consists of all the points on one side of the reference line. In order to decide which side is the proper location, you can solve the inequality for y. Then

$$y > mx + b$$

means that the points are above the line while

$$y < mx + b$$

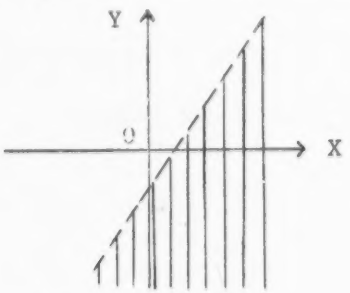
means that the points are below the reference line. A second method of determining which side of the reference line the stipulated half-plane is on is by checking the inequality for any point not on the reference line, $(0, 0)$ being the easiest to use when possible. If the inequality holds, then that point and all points on that side are in the stipulated half-plane. If not, then it is the other half-plane.

For the inequality $2x - y > 1$ check $(0, 0)$

obtaining $2(0) - (0) \stackrel{?}{>} 1$

or $0 \stackrel{?}{>} 1$

Since $0 \not> 1$, the point $(0, 0)$ is on the wrong side.



Question 1
In drawing the graph of the inequality

$$2x - y < 3$$

choose the relation which must first be graphed.

(A) $y > 2x - 3$ (C) $y = 2x - 3$

(B) $y < 2x - 3$ (D) $y < 3 - 2x$

$\frac{70}{1}$

Since this choice says that the two values have the same sign, it is not correct.

Check your work.

Return to page $\frac{58}{1}$ and try question 13 again.

$\frac{70}{2}$

When this inequality is transformed, it yields

$$y < \frac{-3x + 4}{2}$$

Then, the points would all be below the reference line, since y is " less than " which contradicts the problem.

Return to page $\frac{99}{2}$ and try question 5 again.

This graph passes through the point (0 , 2) on the Y-axis and the point (-4 , 0) on the X-axis.

Since the coordinates of the second point do not satisfy the equation, the graph is incorrect.

Return to page 97/2 and try question 3 again.

Since the inequality contains two letters, its graph is not parallel to either axis.

Therefore, this choice is incorrect.

Return to page 84/2 and try question 7 again.

$\frac{72}{1}$

You either made a mistake or you guessed. But you could have checked your work by substitution. Substituting these values, we find that they do not check in either equation.

Therefore, this choice is incorrect.

Return to page $\frac{68}{2}$ and try question 12 again.

$\frac{72}{2}$

It is not sufficient to look at the inequality sign in the original statement in order to locate the solution on the graph. You should first transform the inequality to the form which has y on one side. Then you can tell whether you want the points above the line, or those below the line.

Return to page $\frac{81}{2}$ and try question 9 again.

$\frac{73}{1}$

In transforming the original inequality you seem to have made a basic mistake.

Have you forgotten about the reference line?

Return to page $\frac{69}{2}$ and try question 1 again.

$\frac{73}{2}$

If you replace the inequality sign with an equal sign, you will have the equation of the reference line. Since the graph shows that reference line passes through the origin, coordinates (0 , 0) , these values must check in the equation. Since you can see that these values do not check, this choice must be incorrect.

Return to page $\frac{82}{2}$ and try question 11 again.

$\frac{74}{1}$

Solving the second equation for y gives this value.

Although it is a fraction and, therefore, unpleasant to use; it is the only choice which is correct.

Now proceed to question 6 below.

$\frac{74}{2}$

Question 6

If you apply the method of substitution to solve the set of equations

$$x + 5y - 2 = 0 \text{ and } 2x - y + 5 = 0$$

which value might you use to substitute?

(A) $x = 5y + 2$

(B) $y = 2x - 5$

(C) $y = \frac{2 - x}{5}$

(D) $x = \frac{y + 5}{2}$

$\frac{75}{1}$

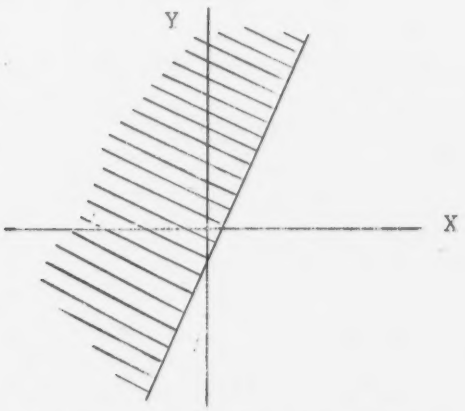
If the reference line is drawn as a solid line, that indicates that the points on the line are included; and the inequality must also contain an equal sign. If the reference line is not included, it should be drawn as a dotted line.

Return to page $\frac{90}{2}$ and try question 8 again.

$\frac{75}{2}$

Your answer is very close, but there are some points of the solution set in quadrant IV.

The graph should be the following:



Return to page $\frac{93}{2}$ and try question 10 again.

$\frac{76}{1}$

This graph crosses the Y-axis at the point (0 , 2) and it crosses the X-axis at the point (2 , 0).

Since the coordinates of the second point do not satisfy the equation, the graph is incorrect.

Return to page $\frac{97}{2}$ and try question 3 again.

$\frac{76}{2}$

When this inequality is transformed, it yields

$$y < \frac{3x - 4}{2}$$

Then these points would all be below the reference line since y is " less than " , which contradicts the problem.

Return to page $\frac{99}{2}$ and try question 5 again.

If you transform the inequality to the form: $\frac{x}{a} + \frac{y}{b} < 1$

$2x + y < 4$ becomes $\frac{x}{2} + \frac{y}{4} < 1$

Now, if (0 , 0)

is substituted $\frac{(0)}{2} + \frac{(0)}{4} \overset{?}{<} 1$ is true

Therefore, all the points in that half plane fit the inequality; but, they are to the left and <u>below</u> the reference line

$$\frac{x}{2} + \frac{y}{4} = 1$$

Therefore, this is not the correct choice.

Please return to page $\frac{80}{2}$ and try question 4 again.

Since this inequality can be transformed to the form

$$y \geq \frac{3}{2} ,$$

the reference line $y = \frac{3}{2}$ is a line parallel to the x axis; but you were looking for a vertical reference line. So the horizontal line is not what we want.

Return to page $\frac{84}{2}$ and try question 7 again.

78/1

This choice is correct.

Now proceed to question 2 which follows:

Question 2

Which do you recognize as the equation of the reference line for the relation

$$x + 2y \geq 5 \ ?$$

(A) $x + 2y = 5$

(B) $x = 2y - 5$

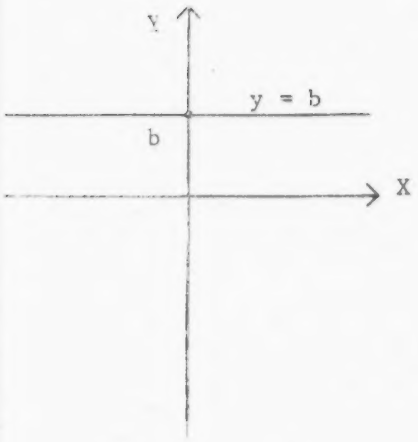
(C) $y = \frac{x - 5}{2}$

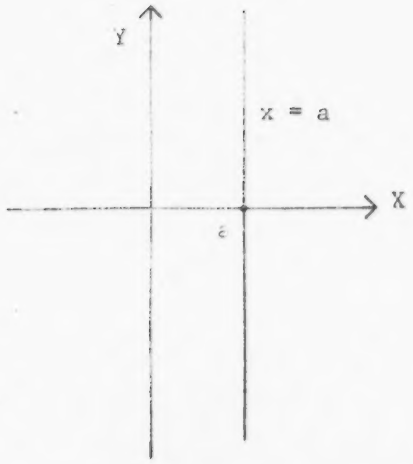
(D) $y = \frac{5}{2} - x$

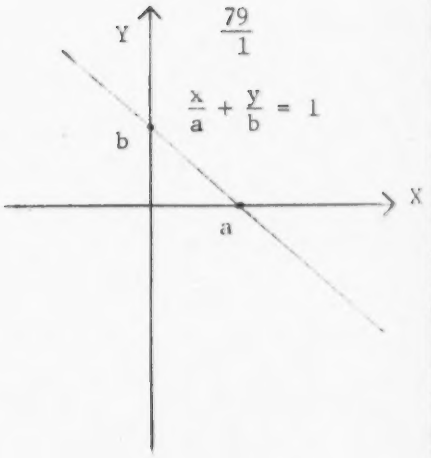
78/2

If you pick a point which is obviously in the required zone its coordinates should fit the inequality. Now any point on the positive portion of the y axis should fit. Try (0 , 1) .

Now return to page 82/2 and test the answers.





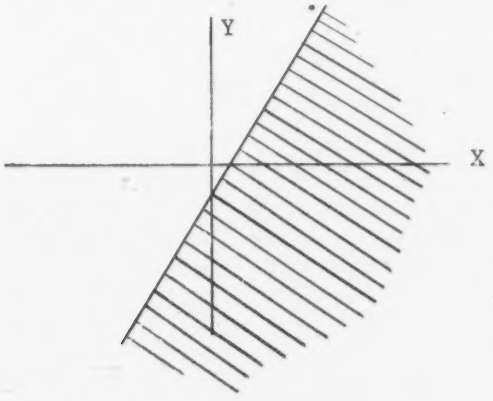


Since the equation contains two letters, its graph is not parallel to either axis. Perhaps you ought to look over your notes on the graph of a straight line.

Return to page $\frac{89}{2}$ and try question 6 again.

$\frac{79}{2}$

You must have a serious error in your graph. The correct graph below shows that most of quadrant IV is included in the solution set.



Return to page $\frac{93}{2}$ and try question 10 again.

80/1

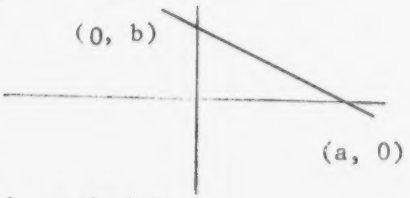
To graph an equation of the form

$$\frac{x}{a} + \frac{y}{b} = 1$$

We discover that when $x = 0$, $y = b$ That is b is the y intercept.

When $y = 0$, $x = a$ That is a is the x intercept.

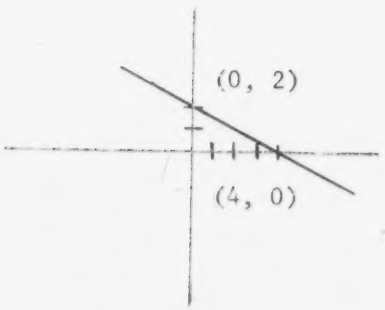
This allows us to graph the equation easily.



We, therefore, apply this method to

$x + 2y = 4$ by dividing by 4

$\frac{x}{4} + \frac{y}{2} = 1$ hence the x intercept is 4 and the y intercept is 2 and the graph sketch looks like this:



Now proceed to question 4 below.

80/2

Question 4

Sketch the graph of each of the following inequalities. You will find that in one case the points all lie above the reference line and also to the left of the reference line. Apply the principles you have learned to find the choice in which this is true.

(A) $2x + y < 4$

(B) $2x + y > 4$

(C) $2x - y > 4$

(D) $2x - y < 4$

The equal sign indicates that all points on the line are included.

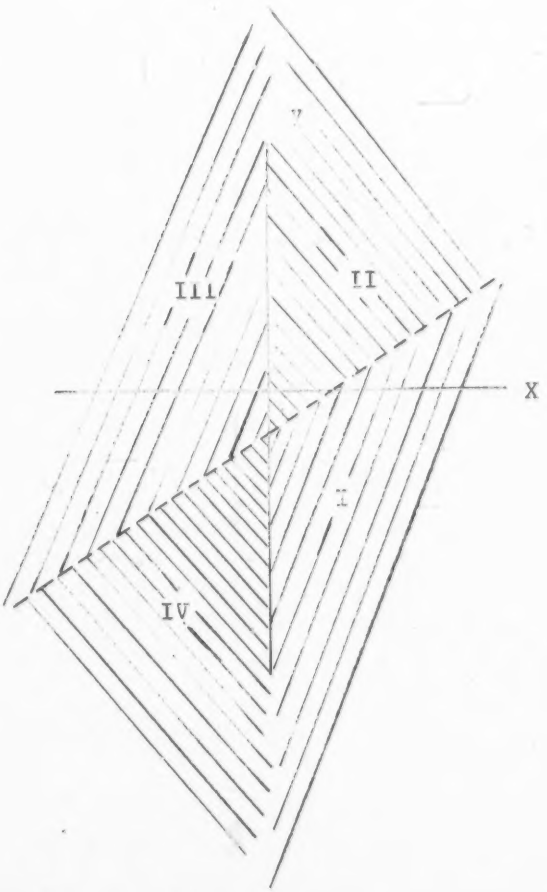
Consequently, the line is drawn solid, and this choice is correct.

Now proceed to question 9 below.

Question 9

The graph shows the line whose equation is $2x - 3y = 6$

Apply your knowledge of inequalities to find the region which contains all the points whose coordinates satisfy the inequality $2x - 3y < 6$



(A) I and IV

(B) I and II

(C) III and IV

(D) II and III

$\frac{82}{1}$

Let us check this one out together.

$2x - y \leq -1$ should be changed to the intercept form:

$\frac{x}{a} + \frac{y}{5} \leq 1$ by dividing by -1 we get

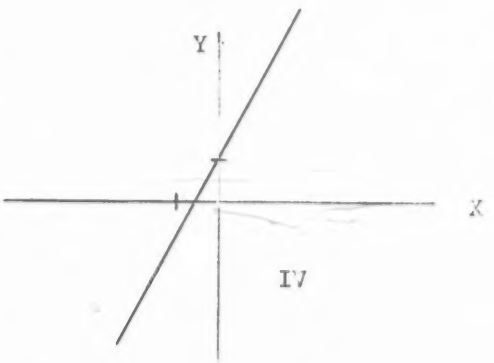
$-2x + y \geq 1$

Note: The inequality was reversed by the division by a negative.
By converting the coefficients to fractions, we get:

$\frac{x}{-\frac{1}{2}} + \frac{y}{1} \geq 1$ Therefore, we graph the intercepts

and the y is 1

and the x is $-\frac{1}{2}$



Since $\frac{(0)}{-\frac{1}{2}} + \frac{(0)}{1} \not\geq 1$

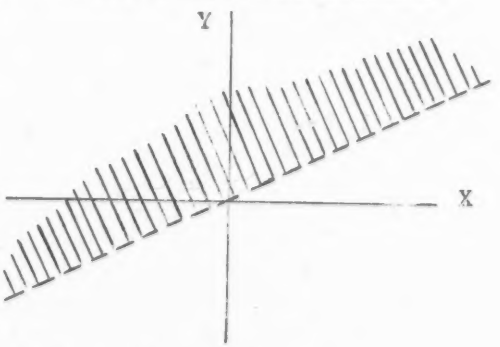
that entire half-plane containing the sign is excluded. Consequently, no points in quadrant IV fit.

Now proceed to question 11 below.

$\frac{82}{2}$

Question 11

The graph shows the solution of one of the following inequalities. Apply your knowledge of graphs to decide which is the correct one.



(A) $x - 2y < 10$

(B) $x - 2y < 10$

(C) $x - 2y < 0$

(D) $x - 2y > 0$

If you decide to transform the original inequality to a form where x is alone on one side, you should subtract $2y$ from both sides, getting

$$x \geq 2y + 5$$

You slipped up on the sign.

Return to page $\frac{78}{1}$ and try question 2 again.

When this inequality is transformed, it yields

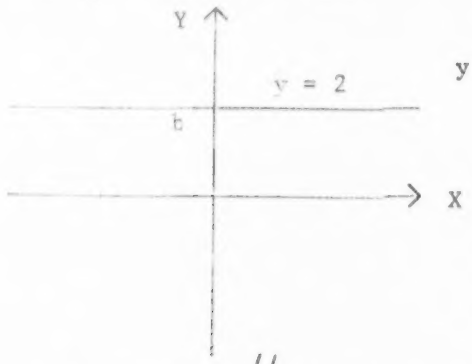
$$y < \frac{3x + 4}{2}$$

Then these points would all be below the reference line since y is " less than " , and this choice is not correct.

Return to page $\frac{99}{2}$ and try question 5 again.

$\frac{84}{1}$

Since the equation $y = b$ (the reference line for $y > b$) is a line // to the x axis



$y > 2$ has the reference line

$y = 2$ which is // to the x axis.

Your choice is correct.

Now proceed to question 7 below.

$\frac{84}{2}$

Question 7

Choose the inequality which has a vertical reference line.

(A) $3x + 2y \leq 6$

(B) $3x + 2y > -6$

(C) $3x + 2 \leq 6$

(D) $3 + 2y \geq 6$

You should begin by transforming each inequality so that y is alone on one side. When you do this you discover that both take on the form

$$y < mx + b$$

Where does that place the solution set with respect to the reference line; above or below?

Return to page 101/2 and try question 13 again.

If you draw the graphs correctly and shade each separate solution set, you will find the overlap. This contains points above the X axis, but it also contains points below the X axis.

Therefore, this choice is not correct.

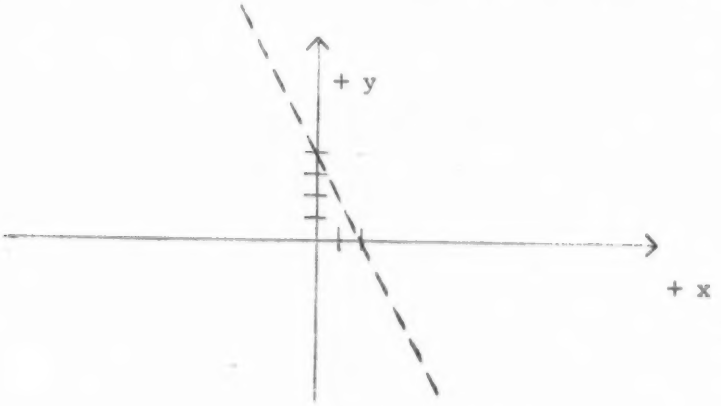
Return to page 104/1 and try question 14 again.

$\frac{86}{1}$

If you transform the inequality to the form

$\frac{x}{a} + \frac{y}{b} > 1$ $\qquad$ $2x + y > 4$ becomes $\qquad$ $\frac{x}{2} + \frac{y}{4} > 1$

or



Now, if $(0, 0)$ is substituted $\frac{(0)}{2} + \frac{(0)}{2} > 1$ is false.

Therefore, all the points in that half plane do not fit the inequality.

The points that do, are to the <u>right</u> and above the reference line

$$\frac{x}{2} + \frac{y}{4} = 1$$

Therefore, this is not the correct choice.

Return to page $\frac{80}{2}$ and try question 4 again.

$\frac{86}{2}$

The dotted line in the graph is the line whose equation is

$$2x - 3y = 6$$

The solution of the inequality is related to this line. Somehow you have become involved with the y axis instead.

Return to page $\frac{81}{2}$ and try question 9 again.

If you pick a point which is obviously in the desired zone, it's coordinates should fit the inequality. If they do, then the coordinates of the points in the entire half-plane fit the inequality. An obvious point is (0 , 1). Let's check it.

$$x - 2y < 0$$

$$(0) - 2(1) \stackrel{?}{<} 0$$

$$0 - 2 \stackrel{?}{<} 0$$

$$-2 < 0 \quad \checkmark$$

Therefore, your choice is correct.

Now proceed to question 12 below.

Question 12

If you draw the graphs for each of the following sets of inequalities, you will find that in one case the solution sets do not overlap. Apply your knowledge of graphs to decide the choice for which this is true.

(A) $y > 2x + 5$
$y < 2x - 2$

(B) $y > 2x + 5$
$y < 3x - 2$

(C) $y > 2x - 5$
$y < 2x + 2$

(D) $y < 2x + 5$
$y > 2x - 2$

$\frac{88}{1}$

If you decide to transform the original inequality to a form where y is alone on one side, you should subtract x from both sides.

This would give

$$2y \geq -x + 5$$

Then dividing by 2 would give the result

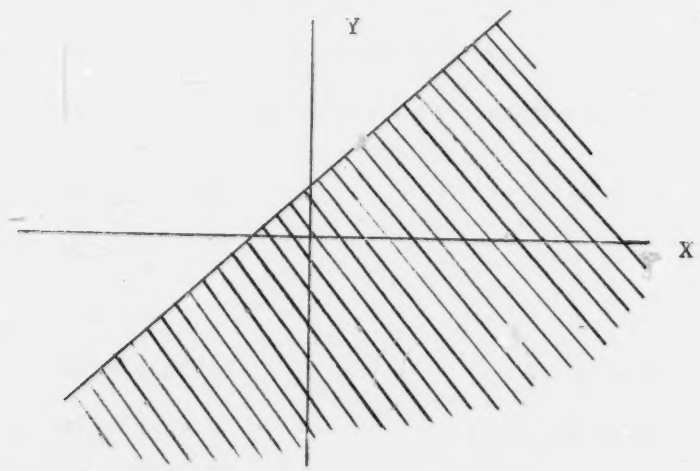
$$y \geq \frac{-x + 5}{2}$$

You have made a mistake in sign. Can you find out where you went wrong in your work?

Return to page $\frac{78}{1}$ and try question 2 again.

$\frac{88}{2}$

You must have made a serious error in your graph. The correct graph below shows that all of quadrant IV is included in the solution set.



Return to page $\frac{93}{2}$ and try question 10 again.

When

$$3x + 2y > 4$$

is transferred into a form where y is isolated, it becomes

$$y > \frac{-3x + 4}{2} \quad \text{or} \quad y > \frac{-3}{2}x + 2$$

Since it states that " y is greater than " , it implies that the y value is above the line. (y values are either above, on, or below the line).

Since this condition is the one specified in the problem, your answer is correct.

Now proceed to question 6 below.

Question 6

Choose the inequality which has a horizontal reference line.

(A) $y > 2x$

(I) $y > 2$

(C) $y > 2x - 2$

(D) $y > -2x - 2$

$\frac{90}{1}$

Since this inequality can be transformed into the form

$$x \leq \frac{4}{3}$$

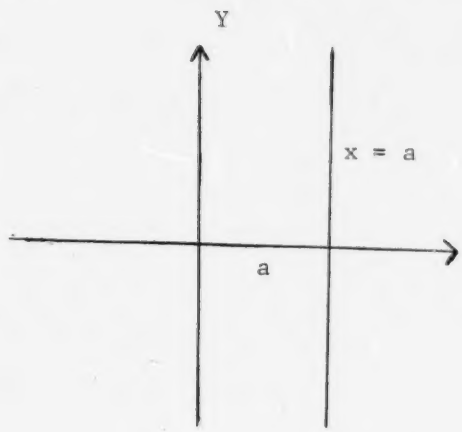
It is of the form

$$x \leq a$$

The reference line would

be $x = a$

This is a line paralled to the Y axis.



Therefore, this answer is correct.

Now proceed to question 8 below.

$\frac{90}{2}$

Question 8

Choose the inequality whose graph would have a reference line that is a solid line.

(A) $x + 5y \leq 7$

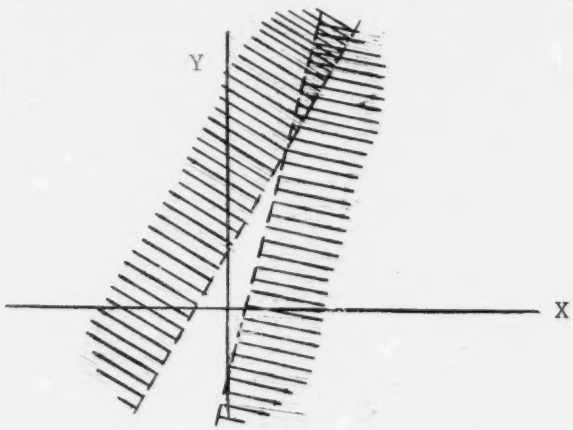
(B) $x + 5 > 7$

(C) $x - 5y > 7$

(D) $x - 5y < 7$

Did you draw the graph of these inequalities?

The correct graph below shows an overlap of solution sets. Of course, if you drew a graph which didn't go far enough, you wouldn't find the overlap.



Return to page 87/2 and try question 12 again.

If you draw the graphs correctly and shade each separate solution set, you will locate the overlap. This contains no points to the left of the Y-axis; and, therefore, this choice is incorrect.

Return to page 104/1 and try question 14 again.

92/1

If you decide to transform the original inequality to a form where y is alone on one side, you should subtract x from both sides. This would give

$$2y \geq 5 - x$$

Then dividing by 2 would give the result

$$y \geq \frac{5 - x}{2}$$

Of course, the expression you have chosen differs from this value. You made an error in forgetting to apply the distributive principle of division over subtraction.

Return to page 78/1 and try question 2 again.

92/2

You should begin by transforming the inequalities so that each has y alone on one side. When you do this, you discover that both take on the form $y >$.

Where does that place the solution set with respect to the reference line; above or below ?

Return to page 101/2 and try question 13 again.

The inequality

$$2x - 3y < 6$$

can be checked easily by substituting the coordinates of any point in it. If these coordinates check, then the entire half plane containing that point fits the inequality.

We generally check with (0,0) then

$$2(0) - 3(0) \overset{?}{<} 6$$

is obviously true. Hence the entire half plane II and III fits.

Now proceed to question 10 below.

Question 10

Apply your knowledge of graphs to determine for which inequality the solution set has NO POINTS in quadrant IV.

(A) $2x - y \leq 1$

(B) $2x - y \leq -1$

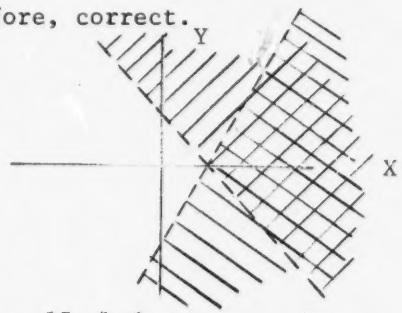
(C) $2x - y \geq 1$

(D) $2x - y \geq -1$

94
1

If you draw the graphs correctly and shade each separate solution set, you will locate the overlap. As shown below, the overlap contains points which are to the right of the point of intersection of the reference lines. Since this point is the point (2,0) , all points of the common solution set have an x value greater than 2 .

This choice is, therefore, correct.



Now proceed to question 15 below.

94
2

Question 15

Apply your knowledge of graphs to find which inequalities have all their common solutions in quadrant IV .

(A) $\begin{cases} x + 3y < 3 \\ x + y > 1 \end{cases}$

(B) $\begin{cases} 3x + y < 3 \\ x + y > 1 \end{cases}$

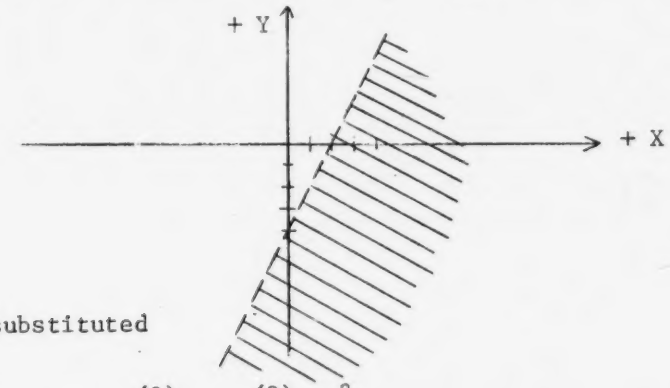
(C) $\begin{cases} x + 3y < -3 \\ x + y > 1 \end{cases}$

(D) $\begin{cases} x + y > -3 \\ x + y < 1 \end{cases}$

If you transform the inequality to the form

$\frac{x}{a} + \frac{y}{b} > 1$ $\quad 2x - y > 4$ $\quad$ becomes $\frac{x}{2} + \frac{y}{-4} > 1$

or



Now if (0,0) is substituted

$$\frac{(0)}{2} + \frac{(0)}{-4} \overset{?}{>} 1$$

is found to be false.

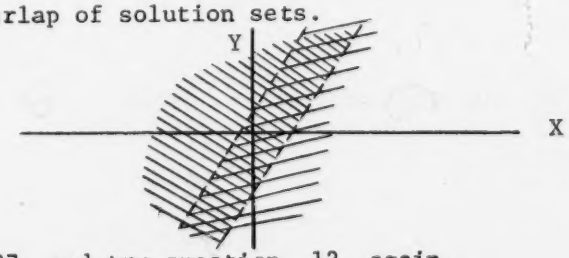
Therefore, all the points in the half-plane not containing (0,0) fit the inequality; but they are <u>below</u> and to the <u>right</u> of the reference line

$$\frac{x}{2} + \frac{y}{-4} = 1$$

Therefore, this is not the correct choice.

Return to page $\frac{80}{2}$ and try question 4 again.

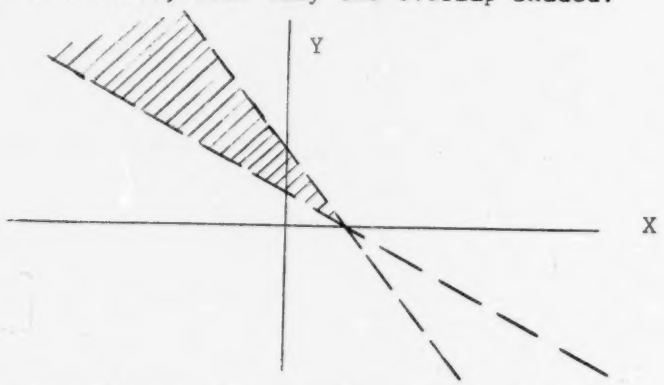
Did you draw the graph of these inequalities? The correct graph below shows a clear overlap of solution sets.



Return to page $\frac{87}{2}$ and try question 12 again.

96/1

If you draw the graphs properly and shade the solution sets, you will find that the overlap contains no points in quadrant IV . The correct graph is shown below, with only the overlap shaded.



Return to page 94/2 and try question 15 again.

96/2

This choice says that one number is the sum of the other number and 17. This is not what the problem stated.

Return to page 110/2 and try question 1 again.

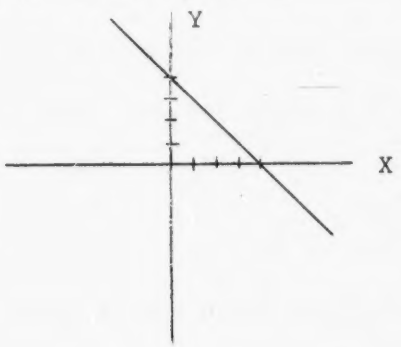
This choice is correct.

Now proceed to question 3 which follows.

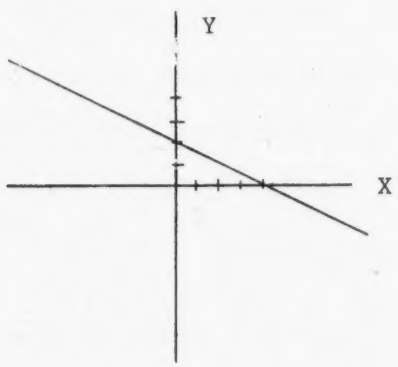
Question 3

Apply the principles of graphing equations to decide which is the graph of $x + 2y = 4$

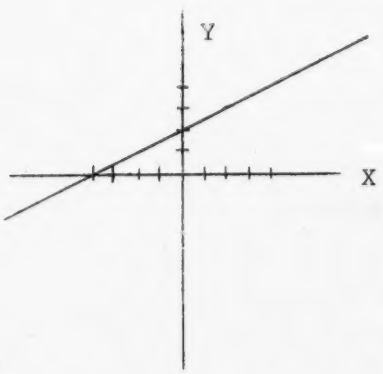
(A)



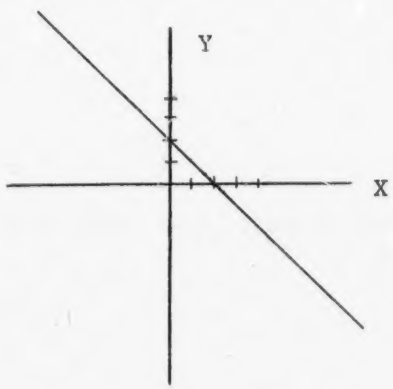
(B)



(C)



(D)



98/1

You should begin by transforming each inequality so that y is alone on one side. When you do this you discover that one takes the

form $y < mx + b$

while the other becomes

$y > mx + b$

You are correct in looking for your solution set above one line and below the other, but haven't you interchanged your reference lines?

Return to page 101/2 and try question 13 again.

98/2

If you draw the graphs correctly and shade each separate solution set, you will locate the overlap. If you now draw the line $y = x$ you will discover that it passes through the overlap region. This indicates that for some values of the solution set $y < x$ while for other values $y > x$

Therefore, this choice is not correct although it comes pretty close. There is a better choice offered to you.

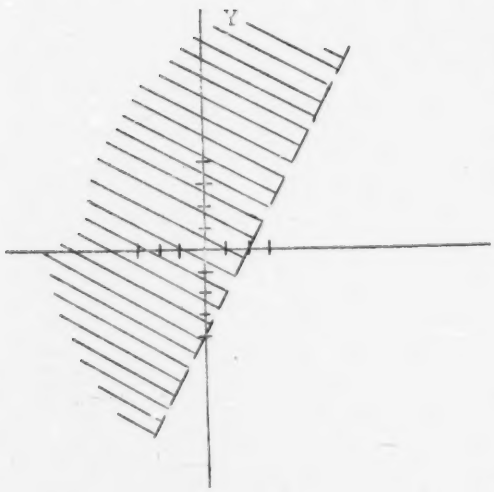
Return to page 104/1 and try question 14 again.

If you transform the inequality to the form

$$\frac{x}{a} + \frac{y}{b} < 1$$

$2x - y < 4$ becomes

$\frac{x}{2} + \frac{y}{-4} < 1$ or graphing the intercepts



Now if (0,0) is subtracted

$\frac{(0)}{2} + \frac{(0)}{-y} \stackrel{?}{} 1$ is found to be true

therefore, all the points in the half-plane containing (0,0) fit the inequality. Also, note this area is <u>above</u> and to the <u>left</u> of the reference line; therefore, this answer is correct.

Now proceed to question 5 below.

<u>Question 5</u>

For one of the following inequalities, the graph is all the points above the graph of its reference line. Apply the principles you have learned to find the inequality which fits this condition.

(A) $3x + 2y < 4$

(B) $3x + 2y > 4$

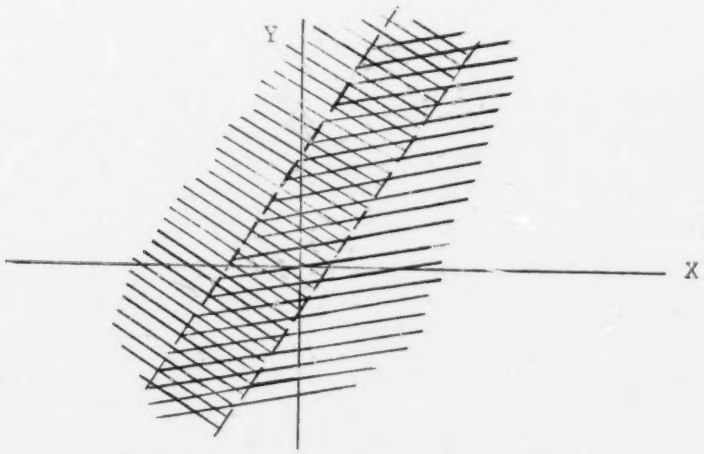
(C) $3x - 2y > 4$

(D) $3x > 2y - 4$

$\frac{100}{1}$

Did you draw the graphs of these inequalities?

The correct graph below shows a clear overlap of solution sets.



Return to page $\frac{87}{2}$ and try question 12 again.

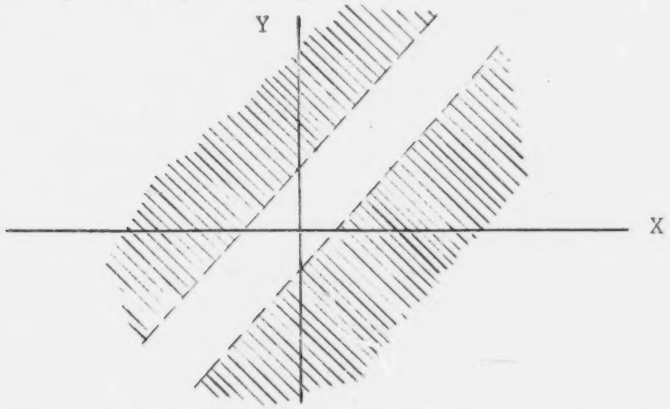
$\frac{100}{2}$

The word "exceeds" should be translated as "is more than."

Since the word "is" becomes an equal sign in algebra, the first sentence starts out as the equation 3x = ...

Return to page $\frac{124}{1}$ and try question 3 again.

If you draw your graph carefully, you discover that the two reference lines are parallel. Since the inequalitites call for all the points above the upper line, and all the points below the lower line, there cannot be any overlap. The graph looks like the illustration below.



Now proceed to question 13 below.

Question 13

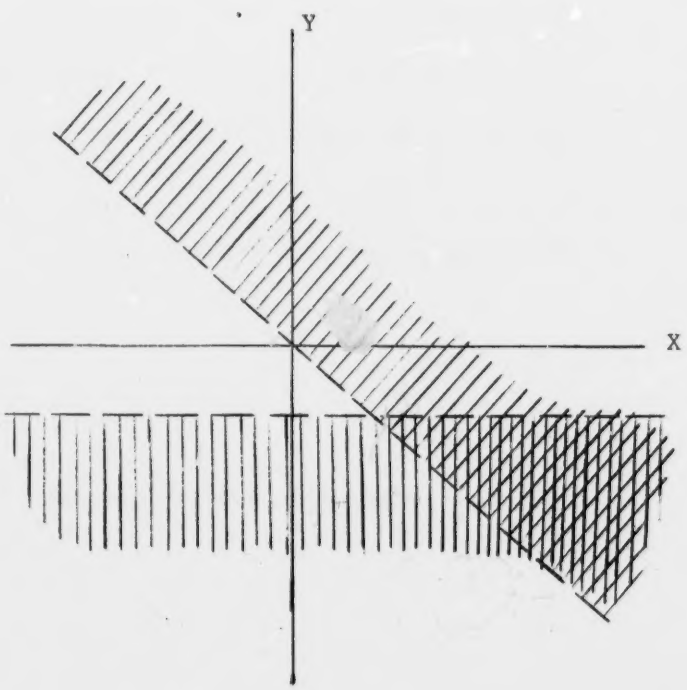
The graph shows the solutions of two inequalities. Apply your knowledge of graphs to decide which is the correct pair of inequalities.

(A) $\begin{cases} x + y < 0 \\ y + 2 < 0 \end{cases}$

(B) $\begin{cases} x + y > 0 \\ y + 2 < 0 \end{cases}$

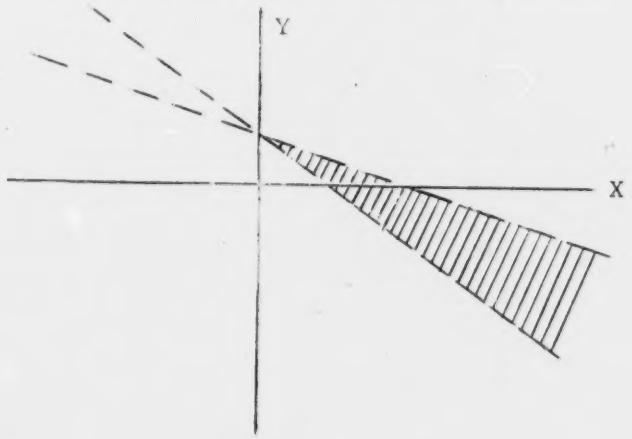
(C) $\begin{cases} x + y > 0 \\ y + 2 > 0 \end{cases}$

(D) $\begin{cases} x + y < 0 \\ y + 2 > 0 \end{cases}$



102/1

If you draw the graphs properly and shade the solution sets, you will find the overlap contains a small section in the first quadrant. However, the question asked for all solutions to be in the fourth quadrant. The correct graph is shown below, with only the overlap shaded.



Return to page 94/2 and try question 15 again.

102/2

Translating this choice into words, we find that it says that the perimeter less five is a certain value. However, the original problem called for "five less than 5 times the width". There is a definite difference in meaning between the two.

This choice is not correct.

Return to page 125/2 and try question 5 again.

This choice is correct.

Now proceed to question 2 which follows.

Question 2

If four times the smaller number is five more than half the larger number, choose the equation which best represents this statement:

The smaller number is represented by **m**; the larger number by p .

(A) $4m + 5 = \frac{1}{2} p$

(B) $4m = \frac{1}{2} p + 5$

(C) $4m + \frac{1}{2} p = 5$

(D) $4m = \frac{1}{2} (p + 5)$

If you wrote the correct equations for this problem and solved them, the values you obtained for the length and the width do not agree with this choice.

Return to page $\frac{127}{2}$ and try question 7 again.

104
1

This choice is correct.

Now proceed to question 14 which follows.

Question 14

Draw a graph to solve the set of inequalities

$$y > -x + 2 \qquad y < 2x - 4$$

Apply your knowledge of graphs to decide which statement is true of every point in the solution set of the pair of inequalities.

(A) $y > 0$

(B) $x < 0$

(C) $x > 2$

(D) $y < x$

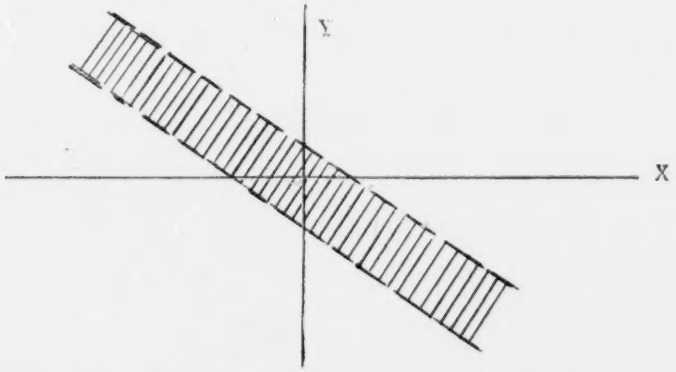
104
2

You may have correct equations and a correct solution of the equations, but this choice is incorrect. Did you interpret your solution incorrectly?

Return to page 126/1 and try question 9 again.

If you draw the graphs properly and shade the solution sets, you will find that the overlap contains many points in each of the four quadrants. The correct graph shown below with only the overlap shaded illustrates that fact.

Therefore, this choice is not correct.



Return to page 94/2 and try question 15 again.

You have found a correct value. However, it is not the correct answer to the question. What were you asked to find?

Return to page 120/1 and try question 6 again.

106/1

The algebraic phrase

$$2x - y$$

is equivalent to the statement

"the difference between double x and y ."

Notice the difference in wording from the original problem.

Although this choice is close, it is not correct.

Return to page 124/1 and try question 3 again.

106/2

You've got the right idea, but didn't you mix up the 50 cent tickets and the 75 cent tickets?

Return to page 113/2 and try question 8 again.

If you have found the numbers which the problem refers to, you will see that this choice is not correct.

Return to page 115/2 and try question 4 again.

Translating this choice into words, we find that it says that the perimeter equals five times five less than the width.

The original problem had these words in a somewhat different order, and the meaning is also different.

Return to page 125/2 and try question 5 again.

$\frac{108}{1}$

If "a is 5 more than b" is to be translated into algebra we write

$$a = 5 + b \quad \text{or} \quad a = b + 5$$

There are other possible statements which are equivalent, but these would be direct translations.

Return to page $\frac{103}{2}$ and try question 2 again.

$\frac{108}{2}$

If the price of a sheet is 20 cents, what is the price for one pillowcase? Do your answers check with the figures of \$2.80 and \$1.90 given in the problem?

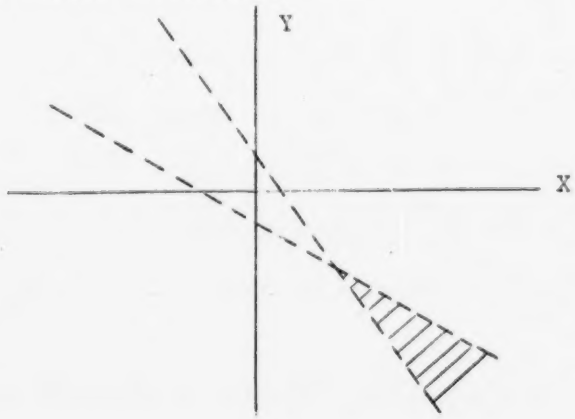
Therefore, this choice is not correct.

Return to page $\frac{112}{1}$ and try question 10 again.

If you draw the graphs properly and shade the solution sets, you will find that the overlap contains only points in quadrant IV .

The correct graph is shown below with only the overlap shaded.

Therefore, this choice is correct.



You have completed this segment. You should do assignment 14 , questions 9 - 12 before going on to segment 4 .

110
1

VOLUME 14 SEGMENT 4 begins here:

Obtain a PUNCH CARD from your instructor. In addition to the other identifying information that must be furnished by you, you are asked to punch out the following:

COLUMNS	48 and 50	2 4	(Sequence Number)
	54 and 56	0 4	(Type of Punch Card)
	60 and 62	1 4	(Volume Number)
	66 and 68	0 4	(Segment Number)

Your READING ASSIGNMENT for this Segment is pg: 372 - 374

In the previous segments of this volume you have investigated several methods for solving two simultaneous linear equations in two variables. These methods are tools to be used. In this segment following you will be given many problems in which you will find that you can apply these new tools.

You will now be asked a series of questions to draw your attention to the more important points.

110
2

Question 1

1. The sum of two numbers is 17 . If each variable represents one number, choose the equation which best translates the statement.

(A) $y = x + 17$ (C) $x + y = 17$

(B) $x = y + 17$ (D) $y = x - 17$

111/1

It appears that you have made two mistakes; one very little one and one serious one. Did you mean your answer to be the length of the rectangle? The serious error concerns the meaning of perimeter. Did you use the fact that the perimeter includes all four sides of the rectangle?

Return to page 120/1 and try question 6 again.

111/2

The second equation is a translation of the statement:

he total number of pounds is 50

But the problem said something quite different.

Therefore, this choice is incorrect.

Return to page 130/2 and try question 15 again.

If you use s to represent the cost of one skirt and b to represent the cost of one blouse, you get the equations:

$$5a + 3b = 29 \quad \text{and} \quad 3s + 5b = 27$$

Solving this set of equations gives the value of s as \$4 and the value of b as \$3.

Therefore, this choice is correct.

Now proceed to question 10 which follows.

Question 10

The laundry charged \$2.80 to launder four sheets and eight pillowcases. The price for three sheets and five pillowcases is only \$1.90. Apply the principles of algebra to decide which statement is true.

(A) The price to launder a sheet is 20 cents.

(B) The price for laundering one sheet is twice the price for laundering one pillowcase.

(C) The cost for laundering one sheet and one pillowcase is 50 cents.

(D) The price per sheet is 10 cents less than the price per pillowcase.

If we represent the length by x and the width by y,

our equations are:

$$2(x + y) = 8(x - y) \quad \text{and}$$

$$2x = 3y + 1$$

Solving these equations, we find that the length is five and the width is three.

Therefore, this choice is correct.

Now proceed to question 8 which follows.

Question 8

Tickets for a class play are sold for a total of $87.50

If x tickets are sold at 50 cents each, and y tickets are sold at 75 cents each; choose the equation which expresses the relation.

(A) $50y + 75x = 8750$

(B) $50x + 75y = 87.50$

(C) $.50 + .75y = 8750$

(D) $50x + 75y = 8750$

114
1

Somehow you got the order of the sentence changed as you translated it into algebra.

This choice says that the sum of four times the smaller and one half the larger is five, which is quite different from the original statement of the problem.

Return to page 103/2 and try question 2 again.

114
2

It is true that many different equations can be written which are equivalent; that is, they have the same solution sets. However, you've slipped up in one small detail.

This choice is almost equivalent to the correct choice, but not quite.

Return to page 125/2 and try question 5 again.

Let's check this one together.

(1) Three times x exceeds twice y by three

$$3x = 2y + 3$$

Note: "exceeds by three" means "is 3 more than"

(2) "the difference between x and y is doubled,"

becomes: $2(x - y)$

"and increased by three," we add 3 $2(x - y) + 3$

"the result is five times y ." $2(x - y) + 3 = 5y$

Now proceed to question 4 below.

Question 4

The smaller of two numbers is 1 less than half the larger. Three times the smaller number exceeds the larger by three. Apply the principles of algebra; solve the two equations and decide which statement is correct.

(A) the larger is three more than the smaller

(B) the sum of the numbers is 17

(C) both numbers are odd

(D) both numbers are even

$\frac{116}{1}$

You have some error; probably in your equations.

This choice is not correct.

Return to page $\frac{126}{1}$ and try question 9 again.

$\frac{116}{2}$

The perimeter of a rectangle includes all four sides.

How many sides did you use in getting the perimeter which you used in your equation?

Return to page $\frac{120}{1}$ and try question 6 again.

117/1

If you wrote the correct pair of equations for this problem and solved them correctly, you got a pair of values for the cost of laundering one sheet and the cost of laundering one pillowcase.

Do your values give this choice as correct?
If so, you have an error in your equations.

Return to page 112/1 and try question 10 again.

117/2

The second equation is a translation of the statement:
the annual income on the 5% investment is $5 less than the income on the 6% investment.

Since this is the reverse of the words of the problem this choice is incorrect.

Return to page 121/2 and try question 12 again.

118
1

If x represents the number of dollars invested at 3%, and y represents the number of dollars invested at 4%, the equations can be understood. The first says that the total income in a year is $5,000

The second says that the total money invested was $170.

This is certainly not correct.

Return to page 128/2 and try question 11 again.

118
2

Since the $1.25 figure was the cost of one pound, and the first equations says that the <u>total</u> cost is $1.25, this choice is not correct.

Return to page 140/2 and try question 14 again.

This choice says that four times the smaller number is one half of five more than the larger number. The change is very slight, but it is different from the original wording, and has a different meaning.

Return to page 103/2 and try question 2 again.

All numbers in a solution should have the same measurement units.
You can write your equation using cents. In that case the individual ticket prices are 50 and 75, but then the total is 8,750 cents.
On the other hand, if you decide to use dollars; the tickets sell at .50 and .75.
That is, the prices are 50 hundredths and 75 hundredths of a dollar. In this case, the total sale was 87 dollars and 50 hundredths of a dollar.
Remember, money may be in dollars or it may be in cents.
You may not mix the two units in any equation. Don't be misled by the fact that we read $87.50 as 87 dollars and fifty cents; it is actually 87 dollars and 50 hundredths of a dollar.

Return to page 113/2 and try question 8 again.

$\frac{120}{1}$

This choice is correct.

Now proceed to question 6 which follows.

Question 6

The perimeter of a rectangle is 24 inches. If twice its width is three more than its length, apply algebraic principles and solve the equation to find the length.

(A) 7 inches

(B) 5 inches

(C) 9 inches

(D) 15 inches

$\frac{120}{2}$

You have probably done something right; the 10 cents is a figure that fits somewhere.

However, this is not the correct choice.

Did you read it carefully?

Return to page $\frac{112}{1}$ and try question 10 again.

If x represents the number of dollars invested at 3% , and y represents the number of dollars invested at 4%; the equations can be understood.

The first says that the total income in a year is \$170

The second says that the total amount of money invested was \$5,000.

Therefore, this choice is correct.

Now proceed to question 12 below.

Question 12

A man invested a certain sum of money at 5% and \$500 less at 6%. The annual income on the 6% investment is \$5 less than the income on the 5% investment. If x represents the number of dollars invested at 5% and y the amount invested at 6%, choose the pair of equations which express the relationships of the problem.

(A)	$x - 500 = y$ $.06y - 5 = .05x$	(C)	$x = y - 500$ $.06y = .05x + 5$
(B)	$y = x - 500$ $.06y = .05x - 5$	(D)	$x + y = 500$ $.05x + .06y = 5$

122
1

This choice indicates that half of $720 was earned at 8% and half at 5%. If $360 were the interest earned at 8%, the investment would have to be 360 divided by .08, which is $4500. In order to earn $360 at 5% the investment would be $7200. Then the total investment would be $11,700. This is close to the $12,000 given in the problem, but it is not correct.

Return to page 134/1 and try question 13 again.

122
2

In the first equation the numbers 80 and 200 represent a number of cents, while the number 62.50 is in dollars; since it was obtained by multiplying $1.25 by 50 . An equation must be all in terms of one unit; that is, it must be all in cents or all in dollars.

Therefore, this choice is incorrect.

Return to page 140/2 and try question 14 again.

Have you forgotten that the entire equation must be written in the same units; either all cents or all dollars?

Return to page 143/2 and try this problem again.

The second equation says that the number of quarters is twice the number of dimes, but this is exactly the reverse of the statement of the problem.

Return to page 152/2 and try question 19 again.

$\frac{124}{1}$

This choice is correct.

Now proceed to question 3 which follows.

Question 3

Three times x exceeds twice y by three. If the difference between x and y is doubled and increased by three, the result is five times y. Choose the pair of equations which correctly translates these statements.

(A) $3x + 2y = 3$ $2(x - y) + 3 = 5y$	(C) $3x = 2y + 3$ $2x - y + 3 = 5y$
(B) $3x = 2y - 3$ $2x - y + 3 = 5y$	(D) $3x = 2y + 3$ $2(x - y) + 3 = 5y$

$\frac{124}{2}$

Since the 3x and the 4y are related to the 3% and 4% of the problem, this is incorrect.

Percent must be expressed either as a common fraction or as a decimal.

Return to page $\frac{128}{2}$ and try question 11 again.

If you use a to represent the smaller number and b the larger, you should get the equations:

$$(1) \qquad a = \frac{1}{2}b - 1$$

$$(2) \qquad 3a = b + 3$$

Solving these equations correctly, we get two numbers whose sum is 17 Let's follow this one all the way. We can use the substitution method by substituting (1) in (2)

$$(2)\ 3(\tfrac{1}{2}b - 1) = b + 3 \quad \text{using the Distributive Law}$$

$$\frac{3b}{2} - 3 = b + 3 \quad \text{adding 3 to both sides}$$

$$\frac{3b}{2} = b + 6 \quad \text{multiplying by 2}$$

$$3b = 2b + 12 \quad \text{subtracting 2b}$$

$$b = 12$$

Substituting this value for b in (1)

$$(1)\ a = \frac{1}{2}(12) - 1$$

$$a = 6 - 1$$

$$a = 5$$

since 5 + 12 = 17 your answer choice is correct.

Now proceed to question 5 below.

Question 5

The perimeter of a rectangle is five less than five times its width. Choose the equation which expresses this relation if r represents the length and s the width.

(A) $2(r + s) - 5 = 5s$

(B) $2(r + s) = 5s - 5$

(C) $2(r + s) = 5(s - 5)$

(D) $2r - 3s = 5$

126
1

This choice is correct.

Now proceed to question 9 which follows.

Question 9

A girl bought five skirts and three blouses for a total of $29. If she had bought three skirts and five blouses at the same prices, she would have spent only $27. Applying the principles of algebra write the equation and solve them to decide which is correct.

(A) one skirt cost $1 more than one blouse

(B) one skirt cost $1 less than one blouse

(C) one skirt cost $2 more than a blouse

(D) a skirt and a blouse cost the same

126
2

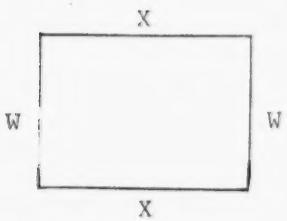
The first equation is a translation of the statement:

the amount invested at 5% is $500 less than the amount invested at 6%.

Since this is the reverse of the statement of the problem, this choice is incorrect.

Return to page 121/2 and try question 12 again.

Let's review the entire problem:



(1) We draw a digram the perimeter is $2(w + x)$

(2) We are told that the perimeter is 24 inches, therefore, our first equation is $2(w + x) = 24$

(3) We are also told that twice the width is three more than the length; that is, $2w = 3 + x$

(4) Both equations are examined to decide on a method for solution

(1) $2(w + x) = 24$ use Distributive Law

(2) $2w = 3 + x$

(1') $2w + 2x = 24$

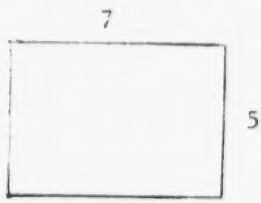
We not that we could substitute the value of 2w from equation (2) into equation (1')

$(3 + x) + 2x = 24$

$3 + 3x = 24$ subtract 3

$3x = 21$ divide by 3

$x = 7$ substitute in (2)



$2w = 3 + (7)$

$2w = 10$

$w = 5$

Check:

$p = 24$

2 x 5 is 3 more than 7

Now proceed to question 7 below.

Question 7

The perimeter of a rectangle is eight times the difference between its length and width. If twice the length exceeds three times the width by one, apply the principles of algebra to find which statement is correct.

(A) the length is an even number

(B) the width is an even number

(C) the length and width are both odd numbers.

(D) the length is an odd number, but the width is even.

128
1

The correct set of equations might be $4s + 8p = 2.80$ and $3s + 5p = 1.90$

Where s represents the number of dollars in the price of a sheet and p represents the number of dollars in the price of a pillowcase.

Solving this set of equations, we find that a sheet costs \$0.30 and a pillowcase \$0.20

Therefore, the total cost for one of each is \$0.50 or 50 cents.

Now proceed to question 11.

128
2

Question 11

A man invested part of $5,000 at 3% and the balance at 4%

If the total interest he earned in a year was \$170, choose the pair of equations which expresses the relationships of the problem.

(A) $.03x + .04y = 5000$
$x + y = 170$

(B) $3x + [illegible] = 5000$
$x + y = 170$

(C) $3x + 4y = 170$
$x + y = 5000$

(D) $.03x + .04y = 170$
$x + y = 5000$

If you write a correct pair of equations and solve them, you will get the amount of money invested at each rate. You can then calculate the amount of interest on each part, and you will discover that this choice is not correct.

Return to page 124/1 and try question 13 again.

It looks like you mixed yourself up on this.

You must read carefully and then re-check your work.

Return to page 143/2 and answer question 16 again.

130
1

The second equation says that the total of the two quantities is 50. That suggests that x and y represent the number of pounds of the different kinds of tea. In the first equation 0.80x would be the number of dollars in the value of x pounds at 80 cents a pound. Also, 2.00y is the value of y pounds at $2.00 each. Since 50 pounds at $1.25 per pound is worth $62.50, this choice is correct.

Now proceed to question 15 which follows.

130
2

Question 15

In mixing peanuts worth 40 cents a pound with cashews worth $1.00 per pound, a grocer wishes to produce a mixture which will sell for a total of $48.00.

If the number of pounds of peanuts is 50 more than the number of pounds of cashews, choose the pair of equations which could be used to find the number of pounds of each that must be used.

(A) $40p + 1.00c = 48.00$
$p + c = 50$

(B) $.40p + 1.00c = 48.00$
$p + 50 = c$

(C) $40p + 100c = 4800$
$p = c + 50$

(D) $40p + 100c = 48.00$
$p = c + 50$

The first equation is a translation of the statement:

the total of the two investments is $500.

Since this was not the fact stated in the problem, this choice is incorrect.

Return to page 121/2 and try question 12 again.

The second equation says that the value of the dimes is twice the value of the quarters. But the problem said that the number of the dimes is twice the number of the quarters.

Therefore, this choice is incorrect.

Return to page 152/2 and try question 19 again.

$\frac{132}{1}$

If you write the correct set of equations for this problem and solve them, you will obtain the number of quarts of heavy oil. You will find that there is less heavy oil than light oil, but not half as much.

Return to page $\frac{135}{2}$ and try question 17 again.

$\frac{132}{2}$

You must not only attempt to solve the problem, but also you must check your answers before you consider yourself finished.

If you write the correct equations and solve them, you will find the number of quarters and the number of half dollars that Amy has.

You will find that this choice is not correct.

Return to page $\frac{138}{2}$ and try question 20 again.

You are quite right in saying that (2 , -1) is a point whose coordinates satisfy this equation. However, have you tried (-8 , -1) ? This point is not on the line whose equation you have chosen.

Therefore this choice is incorrect.

Return to page 148/1 and try question 1 again.

If this point is connected to the point (2 , -3) , you will get a line parallel to the X - axis. When a line is parallel to the X - axis, the ordinates of all the points on it are the same.

Therefore, this choice is not correct.

Return to page 158/2 and try question 3 again.

134/1

This choice is correct.

Now proceed to question 13 which follows:

Question 13

A man invested $12,000, part at 8% and the rest at 5%.

If his total annual income from the investments is $720, apply the principles of algebra to find which statement is correct.

(A) the interest earned at each rate is the same.

(B) the interest earned at 8% is greater than that at 5%

(C) the amount invested at 8% was smaller than that at 5%

(D) the amount invested at 8% was greater than that at 5%

134/2

The second equation is a translation of the statement:

the number of pounds of cashews (c) is 50 more than the number of pounds of peanuts (p). This is exactly the reverse of the words of the problem.

Return to page 130/2 and try question 15 again.

Let's do this one together. Use the chart format.

	No. of lbs.	x	price	=	cost
I	candy c		.80		.80c
	nuts n		1.50		1.50n

The mixture sells for a total of 84 dollars

therefore, $.80c + 1.50n = 84.$

	No. of lbs.	x	price	=	cost
II	candy n		.80		.80n
	nuts c		1.50		1.50c

Note: The number of pounds is reversed.

The mixture would be worth only 77 dollars.

therefore, $1.50c + .80n = 77$

Now proceed to question 17 below.

Question 17

Heavy oil worth 50 cents a quart is mixed with light oil worth 90 cents a quart to produce a mixture of 80 quarts which will sell for 80 cents a quart. How many quarts of each are used?

Apply the principles of algebra to decide which statement is true.

(A) the number of quarts of 50 cent oil is one half the number of quarts of 90 cent oil.

(B) the number of quarts of 50 cent oil is twice the number of quarts of 90 cent oil.

(C) the number of quarts of 50 cent oil is 40 less than the number of quarts of 90 cent oil.

(D) the number of quarts of 50 cent oil is 40 more than the number of quarts of 90 cent oil.

136/1

Since this equation makes a statement about the total number of coins rather than the total value of the coins, it is not correct.

Return to page 146/2 and try question 18 again.

136/2

This equation certainly fits the point (-5 , 2) , but it does not fit the point (0 , 2) . Did you draw a sketch of the graph?

Return to page 153/2 and try question 2 again.

If you write a correct pair of equations and solve them, you will get the amount of money invested at each rate.

You will then find that this statement is not correct.

Return to page 134/1 and try question 13 again.

The first equation says that the total number of cents in the combined value of the peanuts and cashews is $48.00, but the combined value is supposed to be $48.00 not 48.00 cents.

Since you cannot have cents on one side of the equation and dollars on the other, this choice is not correct.

Return to page 130/2 and try question 15 again.

138
1

Let's check this by using the chart format. This time consider the valuation in cents.

No. of coins	Value of each in cents	Value of the group in cents
dimes d	10	10d
quarters q	25	25q

(1) total value is $4.50

$\therefore$ 10d + 25q = 450

(2) number of dimes is twice the number of quarters

$\therefore$ d = 2q

138
2

Amy has 4 more quarters than half dollars. If she spent two half dollars, she would have the same amount of money in quarters as in half dollars.

Apply the principles of algebra to decide which statement is correct.

(A) Amy has $6.00

(B) Amy has 20 coins

(C) Amy has twice as many quarters as half dollars

(D) Amy has exactly six half dollars

If you write the correct set of equations for this problem and solve them, you will obtain the number of quarts of heavy oil and the number of quarts of light oil.

You will find that this choice is not correct.

Return to page 135/2 and try question 17 again.

You are quite right in saying that (-8,-1) is a point whose coordinates satisfy this equation. However, have you tried (2,-1) ? This point is not on the line whose equation you have chosen.

Therefore, this choice is incorrect.

Return to page 148/1 and try question 1 again.

Using x to represent the amount of the first investment and y the second, the two equations should be:

$$x + y = 12{,}000 \quad \text{and} \quad .08x + .05y = 720$$

Solving these two equations, we should find that the amount invested at 8% was actually half of the amount at 5%

Therefore, this choice is correct.

What amount was invested at each rate of interest ?

Proceed to question 14 below.

Question 14

A merchant mixed two kinds of tea; one costing 80 cents per pound and the other \$2.00 per pound. He wishes to produce 50 pounds which will sell for \$1.25 per pound. Choose the pair of equations which could be used to find the number of pounds of each kind that he should use.

(A) $.80x + 2.00y = 62.50$
$x + y = 50$

(B) $80x + 2.00y = 1.25$
$x + y = 50$

(C) $.80x + 2.00y = 1.25$
$x + y = 50$

(D) $80x + 200y = 62.50$
$x + y = 50$

If you write the correct set of equations and solve them, you will find the number of half dollars and the number of quarters that Amy has. You can then check your work and find the total amount of money that she has. The correct statement would have to be that she has more than $6.00 . One of the other choices is correct.

Return to page 138/2 and try question 20 again.

Since this point is on the Y axis, it can hardly be the point where the line crosses the X axis.

Did you sketch the graph?

Return to page 153/2 and try question 2 again.

142/1

Since the left side of this equation is in cents while the right side is in dollars, this is not a correct equation.

Return to page 146/2 and try question 18 again.

142/2

If this point is connected to the point (2,-3), you will get a line which is not parallel to either axis.

Therefore, this choice is not correct. Try sketching the points to help you make the proper choice.

Return to page 158/2 and try question 3 again.

The second equation is a translation of the statement: The number of pounds of peanuts (p) is 50 more than the number of pounds of cashews (c) . This is exactly what the problem stated. The first equation states that the total number of cents in the values of the peanuts and cashews combined is 4800 cents. Again, this agrees with the problem. Therefore, this choice is correct.

Now proceed to question 16 below.

Question 16

If c pounds of candy which is worth 80 cents a pound is mixed with n pounds of nuts worth $1.50 per pound, the mixture sells for a total of $84 .

If c pounds of nuts and n pounds of candy were used, the mixture would be worth only $77 . Apply the principles of algebra to decide which equations can be used to describe the situation.

(A) $80c + 150n = 84$
$150n + 80c = 77$

(B) $.80c + 1.50n = 77$
$1.50c + .80n = 84$

(C) $.80c + 1.50n = 84$
$1.50n + .80c = 77$

(D) $.80c + 1.50n = 84$
$1.50c + .80n = 77$

144/1

If you locate the two points and draw the line connecting them, you will discover that this choice is not correct.

Return to page 148/1 and try question 1 again.

144/2

Since the coordinates of the origin are (0 , 0), the origin does not fit the equation x = 5 . Therefore, this choice is incorrect.

Return to page 151/2 and try question 4 again.

If you locate the points and draw the line connecting them, you will discover that this choice is not correct.

Return to page 153/2 and try question 2 again.

If the line passes through the point (- 5 , 0), those coordinates should fit the equation. However, x = - 5 , and y = 0 do not satisfy this equation.

Return to page 160/2 and try question 5 again.

146
1

Let's do this problem together. Use cents as the common unit.

No. of quarts	x	price	=	cost in cents
x		50		50x
y		90		90y
80		80		80(80)

(1) $x + y = 80$ multiply by 5

(2) $50x + 90y = 6400$ divide by 10

(1') $5x + 5y = 400$

(2') $5x + 9y = 640$ subtract 1' from 2'

$4y = 240$

$y = 60$

therefore, $x = 20$

Check:

	price in dollars	dollars
20	.50	10.00
60	.90	54.00
80		64.00

Since x is 20 less than y your answer choice is correct.

Now proceed to question 18 below.

146
2

The total value of n quarters and x dimes is \$1.25

Choose the equation which expresses the relation.

(A) $n + x = 125$ (C) $25n + 10x = 1.25$

(B) $n + x = 1.25$ (D) $.25n + .10x = 1.25$

Using h to stand for the number of half dollars, and q to stand for the number of quarters, we get the equations:

$$q = h + 4 \quad \text{and}$$

$$25q = 50 (h - 2)$$

Solving this set of equations, we find the number of each type of coin which she has; and we find that the total number of coins is 20 .

You have now completed this segment.

You should do assignment 14, questions 13 - 16 before going on to the next segment.

Volume 14 Segment 5 begins on page 148 .

148
1

VOLUME 14 SEGMENT 5 begins here:
Obtain a PUNCH CARD from your instructor. In addition to the other identifying information that must be furnished by you, you are asked to punch out the following:

COLUMNS	48 and 50	2 5	(Sequence Number)
	54 and 56	0 4	(Type of Punch Card)
	60 and 62	1 4	(Volume Number)
	66 and 68	0 5	(Segment Number)

Your READING ASSIGNMENT for this Segment is page: 349 - 350

SUPPLEMENTARY NOTES:

Through any two points, exactly one line can be drawn. If we are given the coordinates of two distinct points, we can write the equation of the line passing through the points.

If we are given two points with the same ordinate, such as (2 , 3) and (5 , 3) , the line through them is parallel to the X-axis. Then its equation is $y = 3$. In the same way, two points with the same abscissa determine a line parallel to the Y-axis. If the points are (- 2 , 1) and (- 2 , 7) , the equation of the line is $x = -2$.

If the line is not parallel to either axis, we can substitute the coordinates of each point in the formula $y = mx + b$. This gives us a pair of equations which we solve to find the values of m and b . Remember to replace the values of m and b in the formula to get the final equation.
Now proceed to question 1 below.

148
2

Question 1

Which statement do you recognize as true about the line through the points (2 , - 1) and (- 8 , - 1) ?

(A) its equation is $y = 2x - 5$

(B) its equation is $x + y = -9$

(C) it is parallel to the X-axis

(D) it is parallel to the Y-axis

If you try locating each of the points in the other choices and drawing the lines from those points to the given point P, you will discover that one of the other choices is correct.

Return to page 158/2 and try question 3 again.

If you substitute the coordinates of this point in the equation $y - 5 = 0$, you will discover that the values do not check.

Therefore, this choice is incorrect.

Return to page 154/2 and try question 6 again.

150
1

This form of equation indicates that the line is parallel to an axis. But, as you can verify by locating the points, the line RS is not parallel to an axis.

Return to page 162/1 and try question 7 again.

150
2

You can always check an equation of a line that's supposed to pass through a given point by substituting the coordinates of that point in the equation.

Since the coordinates of point E do not fit this equation, it cannot be the equation of line EF.

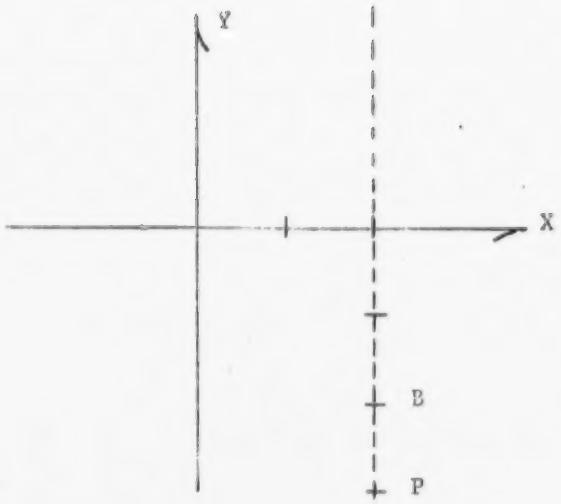
Return to page 167/2 and try question 8 again.

Let's make a quick sketch.

Given P is (2, -3), plot this.

Now draw the line through P that is paralled to the Y axis.

If we check the 3 points given, only (B) (2, -2) is found to be on the line.



Your choice is correct.

Now proceed to question 4 below.

Question 4

The equation of line MN is

$$x = 5$$

Choose the statement which is true.

(A) MN passes through the origin

(B) MN is parallel to the Y-axis

(C) MN is paralled to the X-axis

(D) MN is not paralled to either axis

152
1

Let's check this by using the chart format:

No. of coins	Value of each coin in dollars	Value of all the coins in dollars
n	$ .25	.25n
x	$ .10	.10x
Total		$1.25

$$.25n + .10x = 1.25$$

Your choice is correct.

Now proceed to question 19 below.

152
2

Question 19

John has $4.50 in dimes and quarters. If the number of dimes is twice the number of quarters, choose the pair of equations which could be used to find the number of each kind of coin.

(A) $10d + 25q = 450$
$d = 2q$

(B) $10d + 25q = 450$
$2d = q$

(C) $d + q = 450$
$10d = 2(25q)$

(D) $10d + 25q = 450$
$10d = 2(25q)$

If you plot the two points you will see that since their y values (the ordinates) are the same, the line is parallel to the x axis.

Now proceed to question 2 below.

Question 2

Which statement do you recognize as true about the line through the points (-5,2) and (0,2) ?

(A) its equation is $y = 2$

(B) its equation is $x = -5$

(C) it crosses the X axis at (0,2)

(D) it is not parallel to either axis

154
1

If you examine the coordinates of the two points

(-5, 0) and (-5, 5)

one fact that is common to both that you can observe is that "x = -5"

Well that is the equation!

Now proceed to question 6 below.

154
2

Question 6

The equation of line PQ is

$$y - 5 = 0$$

Choose the correct statement concerning line PQ.

(A) PQ passes through (0, -5)

(B) PQ passes through (-5, -5)

(C) PQ is parallel to the X-axis

(D) PQ is parallel to the Y-axis

A basic principle is "two points determine a line", that is, the line does exist. Now if you are given that a line passes through two known points, its equation can be found by following the principles of this segment.

Return to page 167/2 and try question 8 again.

Since a line parallel to the X-axis has an equation of the form $y = k$, it can be put in the form $y = 0\ x + k$. If the form $y = mx + b$ has m replaced by 0 and b replaced by k, we see that this becomes an equivalent form to $y = k$.

Therefore, this choice is not correct, since its equation can be put in the required form.

Return to page 161/2 and try question 9 again.

156/1

Sketch the graph of $\overline{MN}$ by making a table of values

x	y
5	-
5	-

Note there is no restriction on the y values to be assigned.

You will then see that your choice is incorrect.

Return to page 151/2 and try question 4 again.

156/2

If a line passes through two known points, its equation always exists and can be found by following the principles of this segment.

Return to page 162/1 and try question 7 again.

157/1

Since HK is a line which is not parallel to either axis, its equation can be put in the form $y = mx + b$. Then we need to find the values of m and b in order to write the equation of HK. This choice will not permit us to find the values of m and b, since they are not even in the equations.

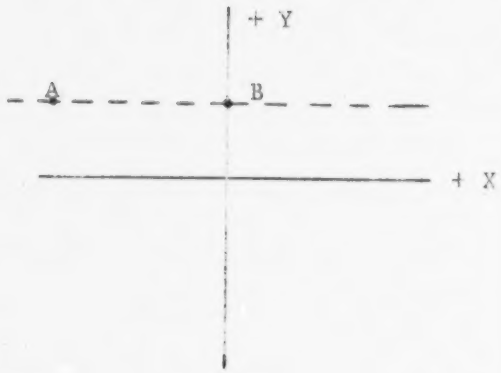
Return to page 175/2 and try question 10 again.

157/2

You have apparently used the correct procedures, but you have made a mistake in signs.

Return to page 171/2 and try question 11 again.

158
1



A sketch of the graph will be a great help

Given: (-5, 2) call it point A

(0, 2) call is point B

Since the line is parallel to the X axis, it is of the form

$$y = k$$

That is, all the points have the same ordinate.

The equation becomes

$$y = 2$$

Also, if you examine the coordinates of the two points

(-5, 2) and (0, 2)

are fact; that is, common to both that you can observe is that

$$y = 2$$

Well, this is the equation that you are seeking.

Now proceed to question 3 below.

158
2

Question 3

The line joining points P and Q is parallel to the Y axis. If P is (2, -3), choose the number pair which may be the coordinates of point Q .

(A) (1, -3)

(B) (2, -2)

(C) (-2 ,3)

(D) None of these

If you check your notes, you will find that a line is parallel to the Y axis if its equation is of the form $x = k$

This equation cannot be put into such a form since it doesn't contain x .

Return to page 154/2 and try question 6 again.

The basic theory to keep in mind is that if a point is known to be on a line, then the coordinates of that point must fit the equation of the line.

Therefore, since the point $(-8, p)$ is known to be on the line

$$y = -\frac{2}{5}x$$

the correct procedure is to replace x by the value -8 and to replace y by the value p . If you do this being very careful with signs, this is not the value which you get for p .

Return to page 176/2 and try question 12 again.

160
1

The given equation says that

$$x = 5$$

and no mention is made of any restriction on the value of y. Therefore, any point whose x value (or abscissa) is 5 should be on the line. We can make a table of values when x is 5, and y can be any value we choose; for example,

x	y
5	-
5	-
5	-

x	y
5	0
5	1
5	2

Drawing the line through the points (5, 0) and (5, 1), you will get a line which is parallel to the Y axis.

Now proceed to question 5 below.

160
2

Question 5

Apply your knowledge of algebra to find the equation of the line through the points (-5, 0) and (-5, 5)

(A) $y = 5$

(B) $y = -5x + 5$

(C) $y + 5 = x - 5$

(D) $x = -5$

These two points are on the X axis. If two points are on a line then that is the only line that can go through both points. The equation of that line is "the equation of the line through the two points," that is sought.

In this case the equation of the X axis

$$(y = 0)$$

is the required equation.

Now proceed to question 9 below.

Question 9

All lines on a graph with one type as an exception can be put into the form

$$y = mx + b$$

Apply the principles of graphs to decide which type line below cannot have its equation put in the form $y = mx + b$

(A) a line parallel to the X axis

(B) a line parallel to the Y axis

(C) a line not parallel to either axis

(D) a line through the origin and the point (-2, 2)

162
1

This choice is correct.

Now proceed to question 7 which follows.

Question 7

A line passes through

R(1, -2) and S(3, 2)

Choose the correct statement about the equation of line RS

(A) it has the form $y = mx + b$

(B) it has the form $y = k$

(C) it has the form $x = k$

(D) its form cannot be determined

162
2

The proper way to find the values of m and b is to substitute the values which you have for x and y in the form equation

$$y = mx + b$$

But what values did you substitute? There is an error since this choice is not correct.

Return to page 175/2 and try question 10 again.

In the process of transforming the equation, there is a division necessary to get ly = ...

You have probably made a mistake in the division.

Return to page 171/2 and try question 11 again.

Since the problem obviously refers to the form equation

$$y = mx + b$$

it is necessary to replace m and b with the proper values.

However, this choice still has the letter m in it.

Can you find the mistake?

Return to page 172/2 and try question 15 again.

Since the point (-8, p) is on the line

$$y = \frac{-2}{5}x - \frac{1}{5}$$

the coordinates of the point should fit the equation.

If we replace x by -8 and y by p, we get the result

$$y = \frac{-2}{5}x - \frac{1}{5}$$

$$(p) = \frac{-2}{5}(-8) - \frac{1}{5}$$

$$p = \frac{+16}{5} - \frac{1}{5}$$

$$p = \frac{15}{5}$$

$$p = 3$$

Your choice is correct.

Now proceed to question 13 below.

Question 13

The set of equations

$$3 = -2m + b \quad \text{and} \quad 1 = -m + b$$

is obtained as a step in finding the equation of a line. Apply the principles of algebra to find the values of m and b.

(A) $m = 2, \quad b = 1$

(B) $m = 2, \quad b = -1$

(C) $m = -2, \quad b = 1$

(D) $m = -2, \quad b = -1$

Using the form equation

$$y = mx + b$$

and substituting the values given, we get the result

$$y = \frac{1}{2}x - 3$$

Since this equation is not equivalent to the equation given in this choice, it is not correct.

Return to page $\frac{180}{1}$ and try question 16 again.

If you follow the procedures taught in this segment, you can find the equation of this line in the form

$$y = mx + b$$

However, this is not the form in which you need the equation. Therefore, it is necessary to transform the equation by the proper steps in order to get the form desired. When you carry out the steps you will discover that the values of a and b do not agree with this choice.

Return to page $\frac{179}{2}$ and try question 20 again.

166
1

According to your notes, a line which is not parallel to either axis can have its equation put in the form

$$y = mx + b$$

Therefore, this choice is not correct.

Return to page 161/2 and try question 9 again.

166
2

The proper way to find the values of m and b is to substitute the values which you have for x and y in the form

$$y = mx + b$$

In one of the equations you did it correctly.
However, in the other equation you have made a mistake.

Return to page 175/2 and try question 10 again.

If you locate the points on the graph, it will be clear that the line joining them is not parallel to either axis. But your notes said that

$$y = mx + b$$

is the form into which you can always put the equation of a line not parallel to either axis.

Therefore, this choice is correct.

Now proceed to question 8 below.

Question 8

A line passes through E (-2 , 0) and F (2 , 0). Apply the principles of a graph to find the equation of line EF.

(A) $x = 2$

(B) $y = 0$

(C) $y = 2x$

(D) it has no equation

$\frac{168}{1}$

To be sure that a point is on a line, the proper procedure is to substitute the coordinates of the point in the equation of the line. If you do this you will find that the resulting equation does not check. If you thought that it did check, your error might be in signs.

Return to page $\frac{177}{2}$ and try question 14 again.

$\frac{168}{2}$

This is the correct form for the equation of the line. However, it is necessary to replace m and b by their values in order to get the equation of this particular line.

Return to page $\frac{172}{2}$ and try question 15 again.

Using the form equation

$$y = mx + b$$

and substituting the values given, we get the result

$$y = \frac{1}{2}x - 3$$

If we multiply both sides by 2

we get $2y = x - 6$

Next, subtracting x

from both sides of the equation, the result is:

$$-x + 2y = -6$$

Finally, we multiply both sides of the equation by

-1

getting $x - 2y = 6$

Did you use a slightly different procedure? As long as your steps are algebraically correct, your result is correct.

Now proceed to question 17 below.

Question 17

Apply your knowledge of graphs to find the equation of the line through

$$(-1, 5) \text{ and } (5, 2)$$

(A) $x = 5$

(B) $y = 5$

(C) $x + 2y = 9$

(D) $x + 2y = 18$

170
1

A line through the origin passing through the point (-2 , 2) is not parallel to the X - axis or to the Y - axis. Therefore, its equation can be put in the form

$$y = mx + b$$

Return to page 161/2 and try question 9 again.

170
2

You should solve the two equations by considering them as simultaneous linear equations with the variables m and b .

If you substitute the values for m and b in the equations you were given, you will discover that they do not check. Did you make a mistake in signs?

Return to page 164/2 and try question 13 again.

If a line passes through two points which do not have the same abscissa (or x value) then the equation of the line can be expressed in the form

$$y = mx + b$$

Now the coordinates of each point must fit the equation of the line.

Therefore, we substitute each set of coordinates in

$$y = mx + b$$

for H (5 , 0) $\quad (0) = 5m + b$

for K (-2 , 3) $\quad (3) = -2m + b$

These two equations can later be solved for m and b to arrive at the actual equation.

Therefore, your answer choice is correct.

Now proceed to question 11 below.

Question 11

If the equation of a line is

$$3x + 2y = 10$$

apply the principles of algebra to find the values of m and b , when the equation is put in the form

$$y = mx + b$$

(A) $m = \frac{3}{2}$, $b = 5$ $\qquad$ (C) $m = -\frac{3}{2}$, $b = 10$

(B) $m = -3$, $b = 5$ $\qquad$ (D) $m = -\frac{3}{2}$, $b = 5$

172
1

To be sure a point is on a line, the proper procedure is to substitute the coordinates of the point in the equation of the line. If you do this, you get

$$5 (1) - 2(-2) = 9$$

which simplifies to

$$5 + 4 = 9$$

Since this checks, it indicates that this point is on the line.

Now proceed to question 15 below.

172
2

Question 15

For a certain line the vlaue of m is found to be -3 and b is 5 . Choose the correct equation for the line.

(A) $y = -3m + 5$

(B) $y = mx + b$

(C) $y = -3x + 5$

(D) $y = -3x + b$

Using the form equation

$$y = mx + b$$

and substituting the values given, we get an equation which does not appear to be equivalent to this choice. If we transform the equation, we get a result which is almost the same as this.

However, you made a mistake along the way.

Return to page $\frac{180}{1}$ and try question 16 again.

If you follow the procedures taught in this segment, you will find the values of m and b by substituting the coordinates of both points in the general form

$$y = mx + b$$

getting two simultaneous equations which you can solve for m and b .

You should, therefore, find that this choice is not correct.

Return to page $\frac{181}{2}$ and try question 19 again.

174
1

We can find the equation by substituting the coordinates of each point in the general form of the equation

$$y = mx + b$$

for point (-1 , 5) (1) $5 = -1m + b$ Subtract

for point (5 , 2) (2) $2 = 5m + b$ eq. 2 from eq. 1

$3 = -6m$ divide by -6

$-\frac{1}{2} = m$

Substitute this in (2) $2 = 5\left(-\frac{1}{2}\right) + b$

$2 = -\frac{5}{2} + b$ add $\frac{5}{2}$

$\frac{9}{2} = b$

Check in (1)

$5 = -1\left(-\frac{1}{2}\right) + \frac{9}{2}$

$5 = \frac{10}{2}$

Now the verified values for m and b can be inserted in the general form

$y = mx + b$

$y = -\frac{1}{2}x + \frac{9}{2}$ multiply by 2

$2y = -x + 9$ add x

$x + 2y = 9$

Your choice is correct.

Now proceed to question 18 below.

174
2

Question 18

Apply your knowledge of graphs to find the equation of the line through (5 , 1) and (-2 , -6)

(A) $x + y = 6$ (C) $y = x + 4$

(B) $x = y - 4$ (D) $x - y = 4$

Since a line parallel to the Y - axis has an equation of the form $x = k$, it would be impossible to solve the equation for y.

Therefore, it cannot be put in the form

$$y = mx + b$$

and this choice is correct.

Now proceed to question 10 below.

Question 10

A line passes through H (5 , 0) and K (-2 , 3). Apply the principles of algebra to find the set of equations whose solutions will permit writing the equation of line HK.

(A) $y = -2x + 3$
$y = x - 5$

(B) $-2 = 3m + b$
$5 = b$

(C) $3 = -2m + b$
$0 = 5m + b$

(D) $3 = -2m + b$
$5 = b$

176
1

Let us run through the method for answering this question to transform the equation into the form

$$y = mx + b$$

You were given

$$3x + 2y = 10 \qquad \text{(subtract } 3x \text{)}$$

$$2y = -3x + 10 \qquad \text{(divide by } 2 \text{)}$$

$$y = -\frac{3}{2}x + 5$$

therefore, $m = -\frac{3}{2}$

$b = +5$

Now proceed to question 12 below.

176
2

Question 12

The equation of a line is

$$y = -\frac{2}{5}x - \frac{1}{5}$$

Apply the principles of algebra to decide the value of p if (-8 , p) is a point on the line.

(A) $p = 3$

(B) $p = -\frac{17}{5}$

(C) $p = -3$

(D) $p = \frac{17}{5}$

Let us review the method together

(1) $3 = -2m + b$

(2) $1 = -m + b$ Subtract the two equations

$2 = -m$ multiply by -1 and use

$m = -2$ the Reflexive Law

Now we can substitute this value in one equation to find b and check both values in both equations.

Substitute in (1) $3 = -2(-2) + b$

$3 = +4 + b$ Subtract 4

$-1 = b$

Therefore, $m = -2$ and $b = -1$

Now we must check. If you substitute the values for m and b in the first equation, you get $3 = -2(-2) + (-1)$

Simplifying, this becomes $3 = 4 - 1$ which certainly checks.

Substituting in the second equestion gives

$1 = -(-2) + (-1)$

which becomes $3 = 2 - 1$

Again, this checks. Therefore, this choice is correct.

Now proceed to question 14 which follows.

Question 14

Apply the principles of graphs to find which point is on the line whose equation is

$5x - 2y = 9$

(A) $(2, -\frac{1}{2})$ (C) $(0, \frac{9}{2})$

(B) $(1, -2)$ (D) $(-2, -\frac{1}{2})$

178
1

Since the problem obviously refers to the form equation

$$y = mx + b$$

it is necessary to replace m and b with the proper values. However, this choice still has the letter b in it. Can you find the mistake?

Return to page 172/2 and try question 15 again.

178
2

If this is the equation of the line through the two given points, the coordinates of the points should check in the equation. It is not sufficient for the check to work for only one point; it must work for both. If you will substitute the coordinates of both points in this equation, you will find that they do not check.

Return to page 174/2 and try question 18 again.

If you follow the procedures taught in this segment, you will form the equations

for (1 , -2) $\quad -2 = 1x + b$

for (-2 , -11) $\quad -11 = -2x + b$

when you solve these, you will find

$$m = 3$$

and $\quad b = -5$

Therefore, this choice is correct.

Now proceed to question 20 which follows.

Question 20

The equation of the line through $(-\frac{1}{2} , 1)$ and $(4 , -2)$ can be written in the form

$$ax + by = 2$$

where a and b are integers. Apply your knowledge of graphs to find which statement is true.

(A) a and b are both even

(B) a and b are both odd

(C) a is even, b is odd

(D) a is odd , b is even

180
1

This choice is correct.

Now proceed to question 16 which follows.

Question 16

For a certain line, the value of m is $\frac{1}{2}$ and b is -3 . Apply your knowledge of graphs to find the equation of the line.

(A) $x - 2y = 6$

(B) $y + \frac{1}{2}x = -3$

(C) $x - 2y = 3$

(D) $x + 2y = 3$

180
2

If this is the equation of the line through the two given points, the coordinates of the points should check in the equation. It is not sufficient for the check to apply only to one point; it must apply to both of them. If you substitute the coordinates of both points in this equation, you will find that they do not check.

Return to page 169/2 and try question 17 again.

If the equations are offered, then you merely have to substitute the coordinates into each equation until you find one where both points fit.

in	x	-	y	=	4
point (5 , 1)	(5)	-	(1)	$\stackrel{?}{=}$	4
			4	=	4
point (-2, -6)	(-2)	-	(-6)	$\stackrel{?}{=}$	4
	-2	+	6	$\stackrel{?}{=}$	4
			4	=	4 ✓

Your answer is correct.

Now proceed to question 19 below.

Question 19

The equation of the line through (1 , -2) and (-2 , -11) can be written in the form

$$y = mx + b$$

Apply your knowledge of graphs to find which statement is true.

(A) m is an odd integer

(B) b is an even integer

(C) m is a negative fraction

(D) b is a positive integer

If your follow the procedures taught in this segment, you can find the equation of this line in the form

$$y = mx + b$$

You ought to get the result: $y = -\frac{2}{3}x + \frac{2}{3}$

Since this is not the form desired, we multiply both sides of the equation by 3 , getting

$$2x + 3y = 2$$

which is the desired form. We can now see that this choice is correct.

You have now completed this segment. Do assignment 14 , question 16 - 20 .

This should complete all of assignment 14 , in preparation for the test on volume 14 .